Phoenixville Area Middle School

Technical Report 2

Richard S Schimpf

Executive Summary

The Phoenixville Area Middle School (PAMS) is a large part of the program developed by the school district to upgrade the educational facilities of their town. The new middle school will provide the students in the area with a modern and engaging building that will serve as a place of learning for decades to come. Specific upgrades over the existing structures are the increased size of the auditorium, addition of a gymnasium and increased utilization of technology. Overall, the total program developed by the district will cost roughly $55 Million. The middle school is scheduled to be completed in May of 2012, and the rest of the campus upgrades will follow soon after.

This report focuses on the schedule of the project in greater detail, a detailed estimate of the structural system, an estimate of general conditions costs, evaluation of LEED credits, and the use of BIM in the delivery process.

Some findings in the examination of the construction schedule are the way the project was loaded for maximum productivity. The building was separated into four work zones in which different phases of construction could take place. This allowed the work site to remain separated, uncongested,, and productive. Without this sequencing, the new middle school would not be ready for their 21012-2012 school year.

Despite not obtaining an official LEED certification, the PAMS did have enough potential "green" credits to qualify. According to the LEED Scorecard, the project would have obtained a LEED Silver rating. Careful construction planning and considerations within the specifications helped earn credits in many areas. Thing such as heat recovery units, water-source heat pumps, and VAV boxed controlling airflow to nearly all rooms is a big step towards energy efficiency.

The use of Bim was limited on the project. However, modeling software was used in some ways to create the final design and communicate with the owner.

Figure 1 – Rendering Provided By Reynolds Construction

Table of Contents

Detailed Schedule Summary

Preconstruction

The preconstruction phase of the Phoenixville Area Middle School took roughly fourteen months before construction started, starting in February of 2009. The project planning started with the school board's hire of Gilbert Architects. After a short period, Reynolds Construction was brought on as the agency CM to help with scope development and cost estimating. During this phase, the project team worked with the school district to finalize the scope of the overall project. During the summer of 2009, an overall project scope was agreed upon that met the needs of the district while coming in within their budget range. After the details were designed, the project was released for bid in early 2010. The Notice to Proceed was issued on May 21st, 2010, beginning the construction of the Phoenixville Area Middle School.

Preconstruction/ Procurement	**Mon 2/2/09**	**Fri 4/9/10**
Schematic Design	Mon 2/2/09	Thu 5/14/09
Design Development	Mon 4/13/09	Thu 8/20/09
Construction Documents	Wed 7/8/09	Wed 1/13/10
Bidding and Award Contracts	Thu 1/14/10	Fri 4/9/10

Figure 1.1 – Preconstruction Activities

General Conditions

General Conditions	**Fri 5/21/10**	**Tue 8/10/10**
E&S Controls, Tree Protection, Fencing:	Fri 5/21/10	Mon 6/14/10
Contractor Staging	Wed 6/9/10	Mon 6/21/10
Site Utilities	Fri 6/18/10	Fri 7/9/10
Strip Topsoil and Stockpile	Fri 6/18/10	Thu 6/24/10
Bulk Excavation and Fill	Wed 7/14/10	Tue 8/10/10
Install Temp. Site/ Student Access Ways	Fri 6/25/10	Sun 7/25/10

Figure 1.2 – General Conditions Activities

Site mobilization started on May 21st, 2010 with the establishment of site boundaries. Safety, which is critical to any successful construction project, was a big concern considering the added risks associated with doing work in such close proximity to a school. Temporary access roads were put in place for both construction site access and for the teachers and students who need to park behind the high school. Excavation began towards the end of this phase, and its completion marked the beginning of the foundation construction.

Construction Phase

The project start date was dictated by the academic calendar. This allowed a maximum amount of time throughout the construction process for work to be done during the summer months when school is not in session. The team was given the completion deadline of the summer of 2012 to have the new middle school ready for occupancy. To accomplish this, the project team developed a sequence of construction that would allow for a maximum amount of trades to operate at one time. Given the building footprint shape, open space available on the school grounds, and several different access roads, Reynolds Construction determined a logistical plan to make this happen. The design of the building allows for the school to be broken into four different areas. These are referred to as Area A – Gymnasium, B – Classrooms and Kitchen, C – Classrooms and Library, and D – Auditorium and Music Rooms. The project schedule located in Appendix A is broken down by this method of phasing. The following narrative explains the manner by which trades are scheduled to perform work throughout the construction process.

Area A Summary Schedule		
Foundation	8/20/10	9/9/10
Slab on Grade	9/23/10	10/28/2011
Structure	11/5/10	11/29/10
Masonry Veneer	1/21/11	3/17/11
Enclosure	4/15/11	
Interior Walls	4/18/11	5/13/11
MEP Systems	4/18/11	10/11/2011
Interior Finishes	8/3/2011	11/21/2011
Final Clean	11/15/11	

Figure 1.3 – Significant Dates of Area A

Area B Summary Schedule		
Foundation	9/9/10	10/13/10
Slab on Grade	9/20/10	12/20/10
Structure	12/29/10	3/16/11
Masonry Veneer	3/17/11	7/18/11
Enclosure	8/29/11	
Interior Walls	7/5/11	9/6/11
MEP Systems	4/29/11	2/16/11
Interior Finishes	8/16/11	12/26/11
Final Clean	4/3/12	

Figure 1.4 – Significant Dates of Area B

Area C Summary Schedule		
Foundation	10/14/10	11/20/10
Slab on Grade	12/29/10	2/2/2011
Structure	2/10/11	4/27/11
Masonry Veneer	4/28/11	7/18/11
Enclosure	10/11/11	
Interior Walls	7/5/11	9/6/11
MEP Systems	6/13/11	3/15/12
Interior Finishes	9/28/11	3/20/12
Final Clean	4/17/12	

Figure 1.5 – Significant Dates of Area C

Area D Summary Schedule		
Foundation	11/18/10	12/20/10
Slab on Grade	12/22/10	2/23/11
Structure	3/17/11	5/18/11
Masonry Veneer	4/28/11	8/19/11
Enclosure	9/20/11	
Interior Walls	6/24/11	8/26/11
MEP Systems	6/13/11	2/29/12
Interior Finishes	9/20/11	1/18/12
Final Clean	4/25/12	

Figure 1.6 – Significant Dates of Area D

The foundation system of the Phoenixville Area Middle School is a shallow reinforced concrete system. The general construction contractor, IMC Construction, is the only one working at this time. The concrete work continues on with the slab on grade. At this point, steel is brought on-site and store on the North-Eastern side of the building footprint. As the concrete is curing a crane is brought on site in anticipation of the steel erection. The superstructure phase beings on November 11th, 2010 with the gymnasium columns. The steel structure portion of the schedule is the most critical to maintain of the entire project. Since the gymnasium and locker rooms require the least out of any areas in terms of finish work or MEP systems, the majority of construction in this area by schedule days in structural activities. The foundation and slab on grade are started immediately in the next area after the completion of Area A's. After steel is completed and there are decks in place in Area A, the superstructure of the next area begins. Masonry workers start in Area A once it is free on the crane. No other work can take place in an Area that has an operating crane in it. The walls are built while the foundation, slab on grade and steel is constructed in Area B. The glazing comes towards the end of the masonry in A. The steel in area B and masonry in Area A are scheduled to be completed simultaneously on March 16th, 2011. While these two trades progress, the building envelope of Area A is completed. Once the building is contained, the MEP and interior contractors begin work on April 18th. The systems contractors (HVAC, Electric, Plumbing, Fire Suppression) do the interior fit-outs while studs and masonry interior walls are installed. Work continues on the interior of the gymnasium until its final clean on November 15th.

In general, the masonry follows immediately after the foundation, concrete slab on grade and steel. The steel is nearly complete in Area C by the time the interior trades come on site to start work in Area A. This was done to allow the interior trades to have a half of site the jobsite to work with when they mobilized. This system put in place allows the mechanical, plumbing, electric, and fire protections trades to get an early start on their work. Safety is not compromised since the large jobsite leaves plenty of open room for maneuverability.

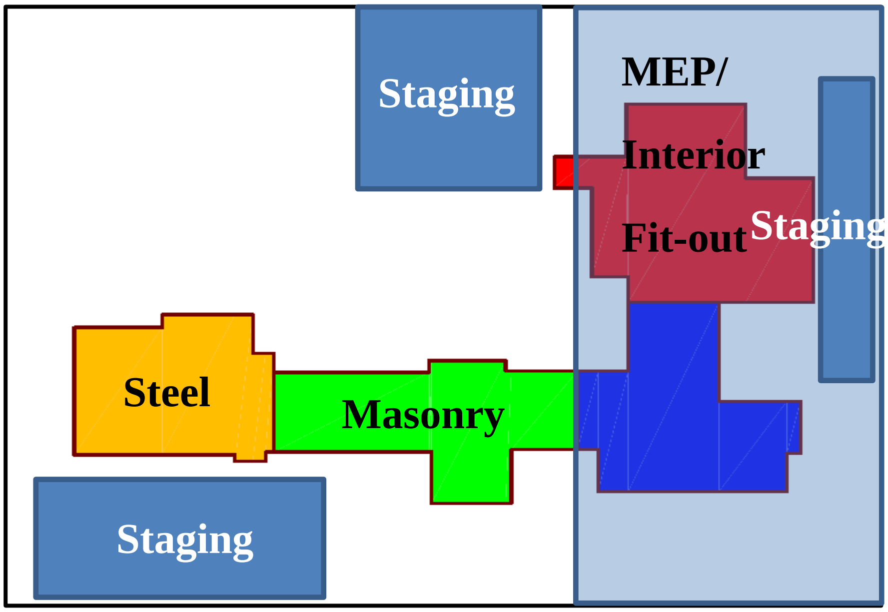


Figure 1.3 – Site Layout March 2011

In Areas B and C, the interior work is done from the top floor down. Work starts on the third floor weeks or months earlier for mechanical, plumbing, electrical, and the interior fit-out and finishes construction. At first this was confusing considering that it is generally the opposite for construction. However, reasons for the top to bottom method could be due to the proximity of Area A and B, and the similarities of the areas in terms of rooms contained. Both have classrooms on the second and third floors, while the first floors have administration offices, the library or kitchen, and open areas. The is a higher density of rooms on the higher floors, so that means more mechanical and electrical controls and runs since each room is individually controlled. MEP fit-out starts prior to the interior walls, so it could be that these trades get in first to these Areas to get these intricate runs set up prior to the presence of other trades.

Detailed Structural Estimate

Estimate Process

The estimate process was initially separated into five categories – foundation, slab on grade, floor and roof decking, beams and joists, and columns. All of these systems were quantified and accounted for completely – the modular system was not utilized since the structure varies throughout the building and accuracy was sought after to the fullest extent. These values were then combined with the most accurate R.S. Means cost line item, and their values determined.

Assumptions

It was assumed that the R.S. Means values included small detail items of installation such as rebar ties and small tools. Subcontractor profit, insurance and other fees not directly associated with the work they are responsible for were excluded from this estimate. Equipment such as cranes, scaffolds, and safety protection were excluded as well.

Estimate Items by Category

Foundations:

- Concrete Material
- Concrete Placement
- Concrete Reinforcing

Slab on Grade:

- Concrete Materials
- Concrete Placement
- Concrete Forms
- Concrete Reinforcing

Decking:

- Acoustical Metal Roof Decking
- Metal Floor Decking
- Concrete Topping
- Concrete Reinforcing

Beams/Joist:

- Structural Steel Wide-Flange Beams
- Structural Steel Tubing
- Structural Steel Trusses

Columns:

- Structural Steel Wide-Flange Beams
- Structural Steel Tubing

Estimate Values:

A detailed breakdown of cost can be found in Appendix B. The cost per category is listed below:

Estimated Foundation Cost	**$231,560.17**
Estimated Slab on Grade Cost	**$264,615.74**
Estimated Elevated Slabs/ Deck Cost	**$717,562.14**
Estimated Structural Steel Beam Cost	**$3,385,334.05**
Estimated Structural Steel Column Cost:	**$687,336.63**
Total Structural Estimate:	**$5,286,408.73**

Figure 2.1 – Cost By Category

Total Building Cost = $44,536,059.00

Percent of Cost by Structure: 11.87%

Estimate Accuracy:

This estimate is lacking somewhat in detail for things such as steel and decking. The bolts of the metal decking, steel beams and steel columns were excluded. The welds for the metal decking and detailing of the structural steel were as well. To account for these things, a factor of 10% used to increase the overall cost of steel. No waste factor was added to concrete foundations or slabs. This may account for discrepancies with the contractor's estimate of the structural cost, along with the fact that IMC Construction had other areas of work in their contract.

General Conditions Estimate

The general conditions estimate for this report was done for the Agency CM on the project, Reynolds Construction. Since the project is being delivered with a multi-prime contract structure, they are not the company at risk for ensuring the project comes in on budget and on time. The costs for site safety, paving, and utilities are covered in the contract of the general construction prime contractor, IMC Construction. However, this estimate combines the cost of project staff employed with Reynolds Construction, as well as their contingencies, and with the site establishment and operational costs associated with IMC Construction. The complete list of line items included in the general conditions estimate is as follows:

- Temporary Facilities
- Temporary Utilities
- Temporary Fencing
- Temporary Protection
- Dumpsters/ Hauling
- Broom Sweep Daily
- General Administration/ Postage
- Project Staff
- Fringes/ Taxes/ Insurance

General Conditions Cost:	**$1,022,063**

This can be compared to project costs from the previous reports:

Total Building Cost:	**$44,536,059.00**
Construction Cost:	**$30,358,109**
Construction Cost + Estimated General Conditions:	**$31,380,172**

The cost of construction summed with the estimated general conditions of Reynolds Construction is far short of the total building cost. However, as previously mentioned, Reynolds Construction was not the ones being paid for general conditions, and therefore not all general conditions items are included within the estimate.

Along with the general condition estimate, a contingency estimate was completed for this section. This was done with an assumed design fee of one-half a percent of total project cost, and a construction fee of an additional two and one-half percent. These contingency was:

Total Project Contingency:	**$1,650,000**

All information on these estimates is shown in Appendix C. A breakdown of estimated general conditions costs is shown below.

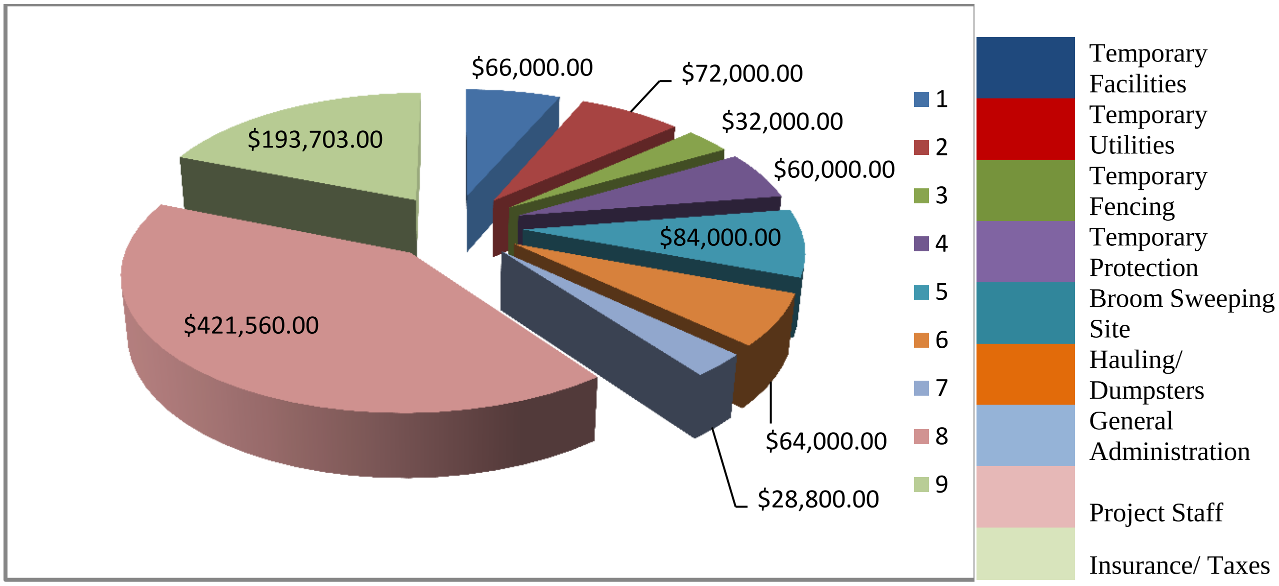


Figure1. Breakdown of General Conditions Costs

Despite not require a larger on-site staff, the project staff still makes up over a third of general conditions costs. The staffing on this project includes an On-site Construction Manager, a Project Manager working half-time, an assistant Project Manager working half time, and a Project Coordinator. The following shows the weekly breakdown of costs associated with general conditions:

Item	**Cost/ Week**
Temporary Utilities	$ 720.00
Temporary Fencing	$ 320.00
Temporary Protection	$ 600.00
Dumpsters/ Hauling	$ 840.00
Broom Sweep Building (laborer)	$ 640.00
General Administration/ Postage/ Copies	$ 288.00
Project Staff	$ 4,215.60
Total	$ 7,623.60

Items paid for upfront, such as trailers and tax, are excluded from the weekly cost breakdown. At $7,623 days a week, a delay in construction would be a large cost to swallow for the project team.

LEED Evaluation

LEED has become the standard of green construction and design practices. By developing a LEED Scorecard for a project the overall efficiency can be judged based on categories created by the United States Green Building Council. This includes not only the design of the building, but the specifications of equipment, materials, construction methods and landscaping.

The Phoenixville Area Middle School project team chose not to apply for LEED certification. The cost of certification exceeded the reimbursement given to certified projects by the Pennsylvania State Government. Despite not applying for a certificate, the project still managed to accrue enough points to qualify for certification. Green elements were a priority of the design team for the Phoenixville Area Middle School. The school district pushed for these in a variety of different areas as shown in the LEED Scorecard. The existing middle school was deemed unsatisfactory in fulfilling the requirements of the academic program. The new middle school not only has to fulfill the needs of space and technology necessary to a modern learning environment, it needs to remain above basic efficiency standards for many decades to come. Since the building is being constructed to give the best possible education to children, an ecologically responsible design is important in setting an example for future generations of students. The push for energy efficiency was also driven by the potential for long-term savings in energy and utility consumption. One of the main reasons for building the new Phoenixville Area Middle School was the lack of gymnasium and auditorium space of the existing building. Athletic and performing arts events will be held after normal school hours, as well as meetings and activities by a host of other organizations, many of which being external organizations within the community. The constant use of the building will mean higher power and water use. This increases the potential of cost savings, making the inclusion of energy reducing design elements more practical. However, the Phoenixville Area School District was limited by this cost-benefit analysis used in the design process. Things that could have increased the energy performance, such as increased commissioning or renewable energy sources, were excluded since the pay-back period was too long.

The Phoenixville Area Middle School scored significant points in each category of the LEED Scorecard. The following shows the summary sheet with the points scored within each of the areas, and the reasoning why certain features were chosen over others. A detailed LEED Scorecard is included in Appendix D.

Sustainable Sites

20		6		Sustainable Sites	Possible Points: 26
Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
		2	Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
		1	Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1

Figure 4.1 – Sustainable Sites

Fourteen of the possible twenty six points were scored in the Sustainable Site category. The points of this section were influenced by the building's function, site, and surroundings more than any other category. The project team had the least effect on points scored since the majority of the line items concerned site selection. The Phoenixville Area Middle School had to be located on campus, and there were not many options on where to put the new school. This helped the project score on items such as site selection and development density. The existing utilities and buildings on campus contributed to these points scored. It also denied the opportunity to score on items such as Brownfield Redevelopment, Site Development - Protect or Restore Habitat, and Site Development - Maximize Open Space. Since the only available place to build was in the existing athletic fields, the redevelopment was not an option. The area is surrounded by housing and a golf course, so there is no habitat available to protect. The open space item was narrowly missed, and was restricted by the buildings and property boundaries of the campus. The alternative transportation categories were a high scoring area for the project. The public transportation access credits were a result of the school bus access for occupants, but the project team chose to add the bicycle storage, public showers, and fuel-efficient vehicle parking. These were added at a time when LEED Certification was still a goal, but they remained after it was decided not to apply since they are such inexpensive additions. Parking capacity was an issue due to the need for student parking along with faculty members. Part of the overall project scope included re-landscaping and moving athletic fields around campus. This created an ideal opportunity to create an effective storm water management design, and the quality and quantity credits became a feasible option. The heat island effect for the roof was chosen due to the benefits energy efficiency, but the non-roof option was too expensive and was ruled out during design development. Light pollution reduction was required due to the neighboring residential areas, which are located just outside campus grounds.

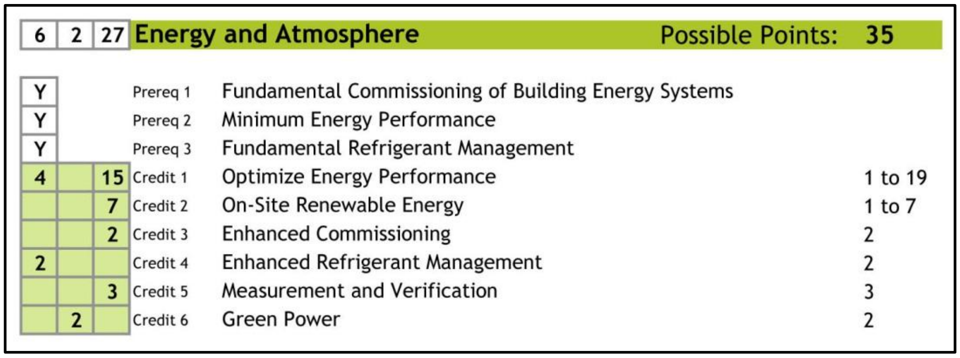
Water Efficiency

6		4	**Water Efficiency**	Possible Points:	10
Y			Prereq 1	Water Use Reduction—20% Reduction	
4			Credit 1	Water Efficient Landscaping	2 to 4
		2	Credit 2	Innovative Wastewater Technologies	2
2		2	Credit 3	Water Use Reduction	2 to 4

Figure 4.2 – Water Efficiency

Water efficiency was a goal from the beginning of the systems design to cut costs on utilities. However, as was the case with many of the categories, the options were limited by cost. The project scored six out of ten in the Water Efficiency category. The water efficient landscaping was part of the re-landscaping of the campus as previously mentioned. There is no landscape irrigation system included in the design of the new campus grounds. Water use was reduced by thirty percent with the inclusion of equipment such as waterless urinals, low flow toilets, sinks, showerheads and hand wash fountains. However, it did not achieve the forty percent required for all four points due the added cost. Innovative wastewater technologies were not included in the scope due to cost.

Energy and Atmosphere



6	2	27	**Energy and Atmosphere**	Possible Points:	35
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
4		15	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
		2	Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
		3	Credit 5	Measurement and Verification	3
	2		Credit 6	Green Power	2

Figure 4.3 – Energy Atmosphere

Despite being a top concern of the owner, the project only scored 6 out of the possible 35 points in the Energy and Atmosphere category. The continual rise in prices for electricity and fossil fuels made efficient energy use an option to save money over time. However, many of the options to decrease building energy use are expensive. The design has eighteen percent optimized energy performance, well short of the top forty four percent. Despite this seemingly low score, many energy saving devices were added to the mechanical system. Water source heat pumps and heat recovery units were included in the HVAC design. There is a future option for on-site renewable energy, with an area left for future photo-voltaic panels if the Phoenixville Area School District chooses to pay for it at a later time. Enhanced commissioning was not included since the added costs could not be fit into the budget. Green power was recorded was listed as possible points since the school district has the option to purchase energy from a renewable source after the building is occupied.

Materials and Resources

6		8	**Materials and Resources**	Possible Points:	14
Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2
2			Credit 4	Recycled Content	1 to 2
2			Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
		1	Credit 7	Certified Wood	1

Figure 4.4

A scored of six out of the possible fourteen points was attained in the Materials and Resources category. The demolition of the existing middle school will not happen until the completion of the new since there needs to be an occupy-able building for the school year. This eliminated the opportunity for points pertaining to building reuse. Materials reuse was not included for fear of price escalation resulting from the complications contractors would have obtaining parts from demolished buildings. However, points were scored in recycled and regional materials. The specifications required that recycled content materials be at a certain percentage, such as the minimum ten percent post-consumer or forty percent pre-consumer content for masonry units. The options for materials manufacturers were listed in the specifications for each material, and each was a regional production company. The middle school design is predominately concrete, masonry and steel; there is minimal wood included in the design, and as a result the points were not scored for rapidly renewable materials and certified wood.

Indoor Environmental Quality

12		3	**Indoor Environmental Quality**	Possible Points:	15
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
		1	Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
		1	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
		1	Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
1			Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

Figure 4.4

Indoor Environmental Quality was the highest scoring category by fraction of the total available points of all. A total of twelve of the possible fifteen points were scored in this area. The conditions of a classroom are important in creating an effective learning environment for students. Research has shown that an effectively controlled climate and day lighting increases the learning potential of people. The points scored in daylight and views reflect the desire of the project team to bring in natural light to the classroom. Interior air quality management plans were developed and reviewed during construction and before occupancy. Each classroom is equipped with individual temperature controls, allowing for ideal conditions and a reduction is wasted energy for heating and cooling. The HVAC system is controlled electronically to monitor the intake of outside air. This system is going to be tested in post-occupancy surveys at 6 and 18 months out. This scored points for the project in several areas, and ensures that the mechanical system will perform at the intended level. However, the increased ventilation points were not scored since the airflow does not exceed the required levels. This was regarded as a low priority feature, and was left out to control cost. The rest of the line items are relatively inexpensive inclusions, and are standard amongst modern buildings. Motion sensors in each room control the lighting. Low-emitting materials were used for adhesives and sealants, paints and coatings, and flooring systems. Composite wood and agri-fiber products did not score points since they are negligible in the overall composition of the building.

Innovation and Design Process

5		1	Innovation and Design Process	Possible Points:	6
1			Credit 1.1	Innovation in Design: Green Building Education	1
1			Credit 1.2	Innovation in Design: School as Teaching Tool	1
1			Credit 1.3	Innovation in Design: Exemplary Performance MRc4	1
1			Credit 1.4	Innovation in Design: Exemplary Performance MRc5	1
		1	Credit 1.5	Innovation in Design:---	1
1			Credit 2	LEED Accredited Professional	1

Figure 4.5

Five out of a possible six points were scored in Innovation and Design Process. This area may include other line items not listed, but since LEED Certification was not sought after one line is left blank. Green building education was included since the Phoenixville Area School District was new to green design. The project team needed to educate them on the available design options available to them in order to make an educated group decision on the most valuable features to fit into the budget. The school will serve as a teaching tool in the future since it will help to educate students on green practices. This has become a popular topic, and with the growing green movement the new middle school will be a valuable resource to the district upon its completion. Exemplary performance for material and resources line 4 and 5 are included due to the requirements of the specifications. Finally, the Senior Pre-Construction Manager Walt Tack, P.E., was the LEED Accredited Professional on the project.

Regional Priority Credits

Regional priority credits were not included on this project since certification was not pursued.

Total Points: 55 out of possible 110 - 2 undetermined, 53 failed to apply

Certification Level: LEED Silver (50-59)

The fact that the Phoenixville Area Middle School has enough points on the scorecard to qualify for a LEED Silver rating is impressive considering that certification was determined to be too expensive. The school district should be credited in pursuing the green features in the design of the building, and the project team did a quality job managing the costs and concerns of the owner in delivering the final product. This level of certification is appropriate considering the source of funding and intended use of the building. Many of the innovative, highly-efficient building designs are built for universities or private entities of a much larger scale that wish to make a statement with their buildings. This project was funded by taxpayer's money, and the budget was a controlling issue from the beginning of the design process. Middle schools are not meant to be innovative projects, but are designed to meet the needs of the academic program set in place by the school district and community. The inclusion of the water-source heat pumps, heat recovery units, and individual room control of thermal systems stood out amongst the other features. These devices are still gaining popularity in the construction industry. They increase the energy efficiency of the building, and allow for greater comfort in each room. There is no better example in this project of the project team working together to design a final product that satisfies the needs of the owner. The main area of improvement would be further optimizing energy performance. As the prices of new technologies such as LED lighting fixtures and photovoltaic cells continue to go down, the opportunity to replace existing systems with these more efficient pieces of equipment may prove to be a practical option.

BIM Use Evaluation

The use of design software was only utilized on the project by the architectural firm Gilbert Architects and their structural engineering consultants Baker, Ingram & Associates. A phone interview with the main representative for the architects was conducted to identify the use of BIM on the Phoenixville Area Middle School project. The used by phase are listed below.

Planning:

The planning phase did not require the use of BIM software for the project team. This phase consisted mostly of working with the school district in establishing options that would meet the needs of the academic program planned. The building site was already known, as the only available space was that on the Western side of campus. The programming was more about needed upgrades over the existing middle school. Since the overall project scope included a district administration office and upgrades to athletic facilities, the planning phase was more about fitting these needs into the different areas on campus. The actual drawing of the building was done with software, however this was not until the modular design of classrooms and overall layout was complete.

Figure 5.1 – Rendering of Phoenixville Area Middle School Couurtesy of Gilbert Architects

Design

The design phase was the main area of BIM use. However, the only real modeling took place in Autodesk Revit, and there was limited coordination between parties. Gilbert Architects put the model into Revit in order to use it for construction documents. Baker, Ingram & Associates also used it to model the structural system. However, coordination between parties did not go beyond these two. Reynolds Construction was responsible for the schedule, logistics, and estimating of the middle school. They fulfilled their responsibilities by utilizing the construction documents created by the Revit model, but did not use the virtual model itself for these purposes. The Mechanical, Electrical, and Plumbing contractors did not utilize BIM in any way. All of the contractors who are responsible for construction on the project were not brought in until the final design of all building systems was complete. Things such as cost estimating, 4-d modeling and MEP clash detection were not used in any manner.

The model was used in a limited extent for communications with the owner. Only the Head Facilities Director was exposed to the model. This however was only to verify that the program developed in the planning phase fulfilled all the requirements established. The renderings created with the software were showcased in presentations with the school board. Beyond that, BIM was not used for owner communication.

Construction and Operations Phase:

BIM was not used in the construction and operations phase. This makes sense for the project considering the delivery method and building function. The multi prime delivery method would make BIM use difficult. With no central At-risk Construction Management firm to oversee coordination, modeling would become confusing and potential detrimental. The building design itself is relatively simple in complexity. There are modular classroom designs, and the areas within the building that have different uses are separated. In terms of operation, the building itself would not be very different from the existing school. The HVAC equipment is monitored electronically, and the electrical and plumbing do not differ much from the existing.

Evaluation

The extent to which BIM was utilized on the project was appropriate. The building design and site conditions did not present many challenges to the project team that might present potential reductions in risk and cost by utilizing software coordination. The design team used it to a limited extent to create the construction documents and communicate with the owner. However, once the documents had been established the use of BIM would only have created problems and added cost to the project. The representative of Gilbert Architects said that the prime contractors used on the project are new to BIM use in general, however their exposure to it is growing. If a model was forced upon them for coordination, it would potential create more confusion that coordination. The design of the Phoenixville Area Middle School is simple in layout and function. There are no complex design elements whose construction would need to be coordinated to alleviate extensive risk to parties. The only way to justifiably implement BIM on this project would be if the project team had decided to become LEED certified. BIM could then be used to analyze the building systems in the attempt to obtain certification.

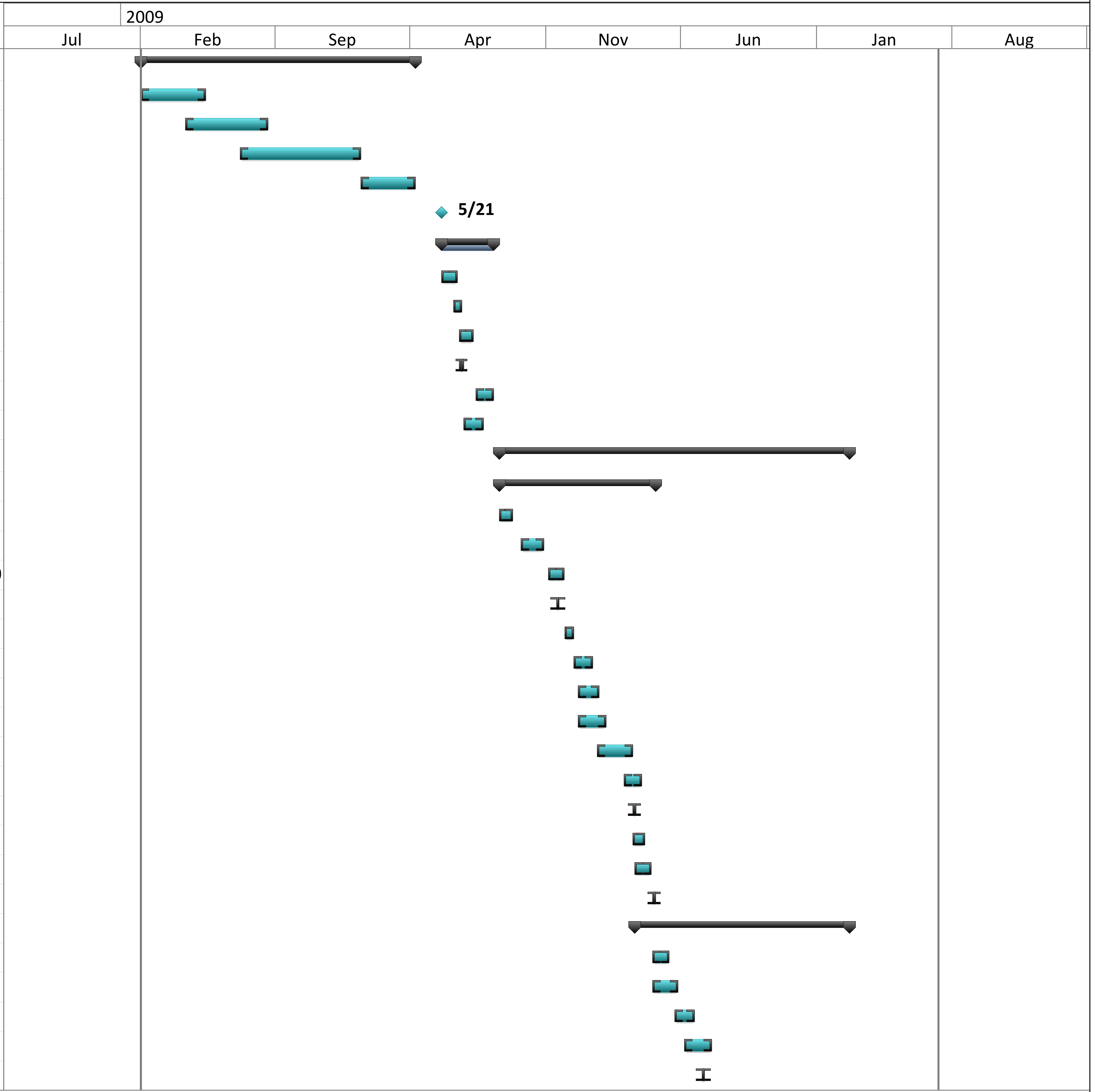
Figure 5.2– BIM Goals for PAMS

PRIORITY (HIGH/ MED/ LOW)	GOAL DESCRIPTION	**POTENTIAL BIM USES**
High	Maximize Efficiency of Design Process	Design Authoring
Med	Rendering Used for Owner Review	Design Reviews
High	Used for Project Documents	3D Coordination
Low	Used Mostly For Structural Documents Not Analysis	Structural Analysis

Figure 5.3 – BIM Use by Phase PAMS

	PLAN	**X**	**DESIGN**		**CONSTRUCT**		**OPERATE**
	PROGRAMMING	**X**	**DESIGN AUTHORING**		**SITE UTILIZATION PLANNING**		**BUILDING MAINTENANCE SCHEDULING**
	SITE ANALYSIS	**X**	**DESIGN REVIEWS**		**CONSTRUCTION SYSTEM DESIGN**		**BUILDING SYSTEM ANALYSIS**
		X	**3D COORDINATION**		**3D COORDINATION**		**ASSET MANAGEMENT**
		X	**STRUCTURAL ANALYSIS**		**DIGITAL FABRICATION**		**SPACE MANAGEMENT / TRACKING**
			LIGHTING ANALYSIS		**3D CONTROL AND PLANNING**		**DISASTER PLANNING**
			ENERGY ANALYSIS		**RECORD MODELING**		**RECORD MODELING**
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABLITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)		**PHASE PLANNING (4D MODELING)**		**PHASE PLANNING (4D MODELING)**		**PHASE PLANNING (4D MODELING)**
	COST ESTIMATION		**COST ESTIMATION**		**COST ESTIMATION**		**COST ESTIMATION**
	EXISTING CONDITIONS MODELING		**EXISTING CONDITIONS MODELING**		**EXISTING CONDITIONS MODELING**		**EXISTING CONDITIONS MODELING**

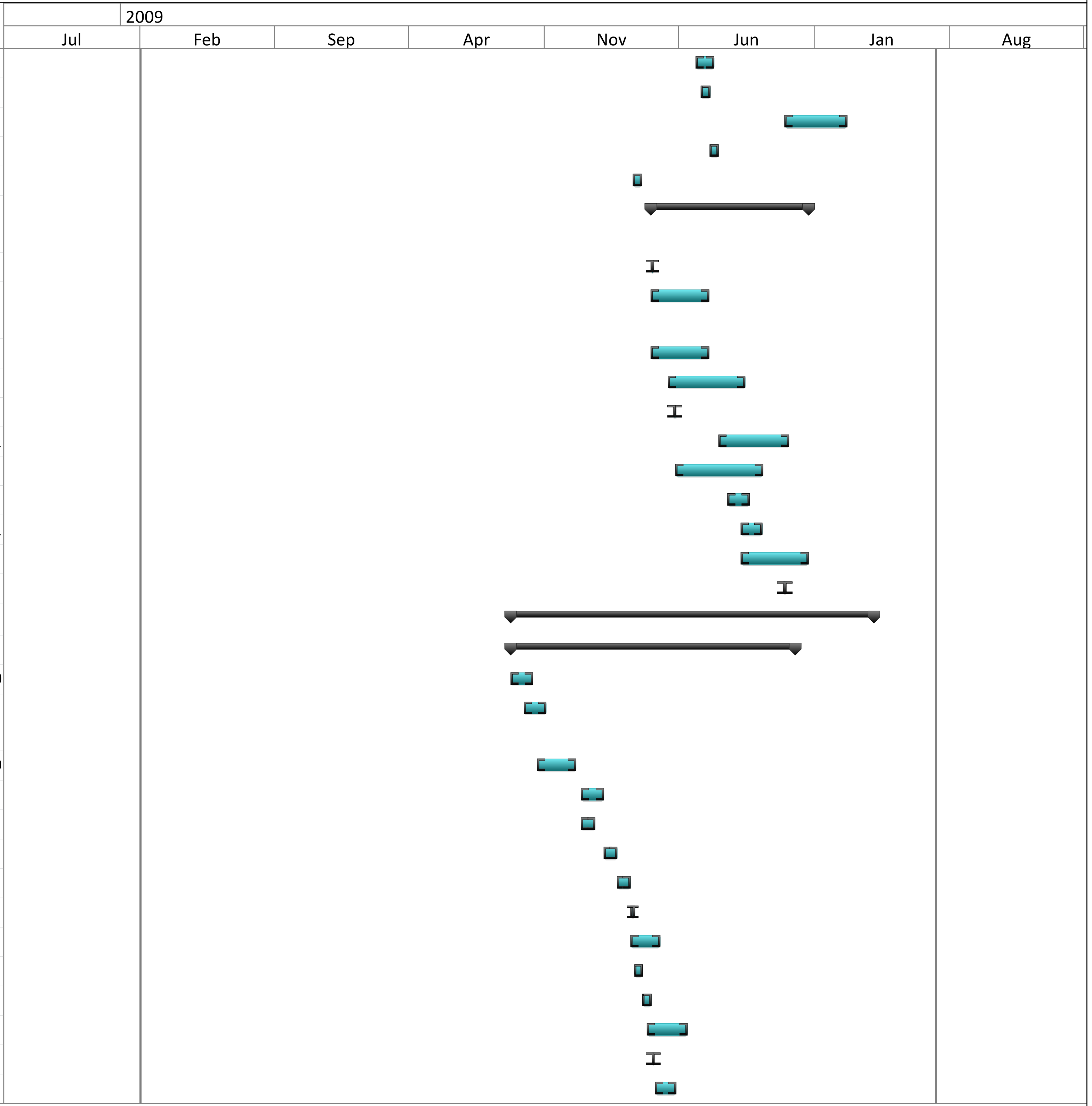
ID	ℹ	Task Mode	Task Name	Duration	Start	Finish
1			**Preconstruction/ Procurement**	**310 days**	**Mon 2/2/09**	**Fri 4/9/10**
2			Schematic Design	74 days	Mon 2/2/09	Thu 5/14/09
3			Design Development	94 days	Mon 4/13/09	Thu 8/20/09
4			Construction Documents	136 days	Wed 7/8/09	Wed 1/13/10
5			Bidding and Award Contracts	62 days	Thu 1/14/10	Fri 4/9/10
6			**NTP - Construction Start**	0 days	Fri 5/21/10	Fri 5/21/10
7			**General Conditions**	**58 days**	**Fri 5/21/10**	**Tue 8/10/10**
8			E&S Controls, Tree Protection, Fencing:	17 days	Fri 5/21/10	Mon 6/14/10
9			Contractor Staging	9 days	Wed 6/9/10	Mon 6/21/10
10			Site Utilities	16 days	Fri 6/18/10	Fri 7/9/10
11			Strip Topsoil and Stockpile	5 days	Fri 6/18/10	Thu 6/24/10
12			Bulk Excavation and Fill	20 days	Wed 7/14/10	Tue 8/10/10
13			Install Temp. Site/ Student Access Ways	22 days	Fri 6/25/10	Sun 7/25/10
14			***Area A***	**393 days**	**Fri 8/20/10**	**Tue 2/21/12**
15			**Building Shell**	**176 days**	**Fri 8/20/10**	**Fri 4/22/11**
16			Reinforced Concrete Foundation Footings	15 days	Fri 8/20/10	Thu 9/9/10
17			Slab on Grade	26 days	Thu 9/23/10	Thu 10/28/10
18			Erect Steel and Joists	17 days	Fri 11/5/10	Mon 11/29/10
19			Erect Barrel Trusses	2 days	Fri 11/19/10	Sat 11/20/10
20			Steel Bolt-up, Detailing	10 days	Wed 12/1/10	Tue 12/14/10
21			Steel Roof Decking/ Metal Roof	22 days	Wed 12/15/10	Thu 1/13/11
22			MEP Perimeter Rough-in	24 days	Wed 12/22/10	Sun 1/23/11
23			Perimeter Masonry	32 days	Wed 12/22/10	Thu 2/3/11
24			Masonry Veneer and Clean	40 days	Fri 1/21/11	Thu 3/17/11
25			Entrances	20 days	Fri 3/4/11	Thu 3/31/11
26			Barrel Vaulted Canopy Steel	3 days	Fri 3/18/11	Tue 3/22/11
27			Aluminum Window Systems	13 days	Fri 3/18/11	Tue 4/5/11
28			Insulation, Built-up Roofing	20 days	Mon 3/21/11	Fri 4/15/11
29			Set Roof-Top HVAC/ Electric Equipment	5 days	Mon 4/18/11	Fri 4/22/11
30			**Main Gym - Systems and Finishes**	**242 days**	**Mon 3/21/11**	**Tue 2/21/12**
31			Interior Masonry, Metal Frames & Studs	20 days	Mon 4/18/11	Fri 5/13/11
32			MEP Interior Rough-in	30 days	Mon 4/18/11	Fri 5/27/11
33			PA, Fire Alarm Installation	23 days	Mon 5/23/11	Wed 6/22/11
34			Interior Finish & Paint	31 days	Tue 6/7/11	Tue 7/19/11
35			Pour Equipment Pads	2 days	Wed 7/6/11	Thu 7/7/11



Project: PAMS Schedule
Date: Fri 10/21/11

Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Deadline
Progress

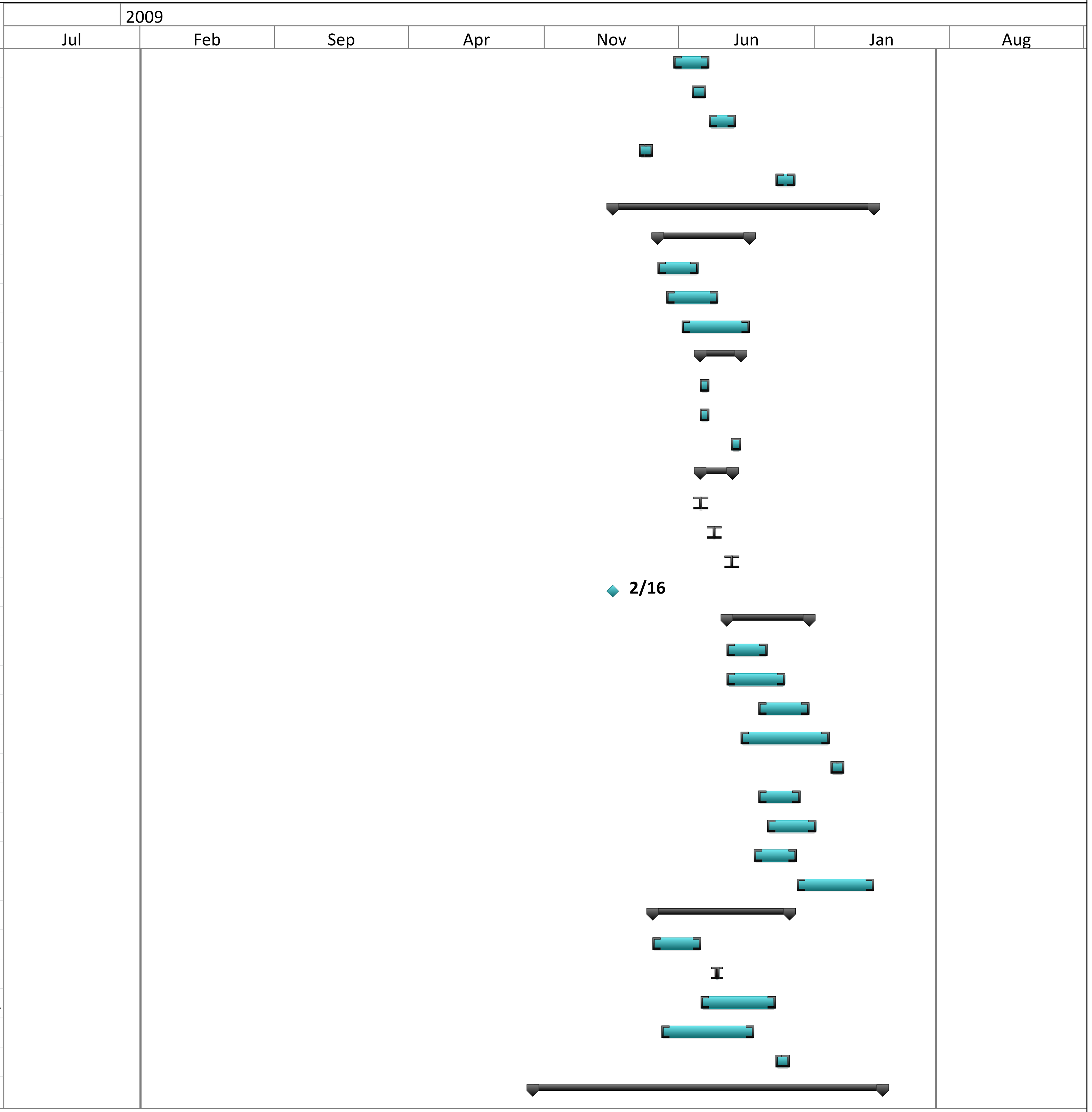
ID		Task Mode	Task Name	Duration	Start	Finish
36			MEP Equipment Installation & Finish	21 days	Tue 6/28/11	Tue 7/26/11
37			Lighting Gymnasium	11 days	Wed 7/6/11	Wed 7/20/11
38			Wood Flooring System	71 days	Tue 11/15/11	Tue 2/21/12
39			Gymnasium Equipment/ Casework	10 days	Wed 7/20/11	Tue 8/2/11
40			Final Cleaning	11 days	Mon 3/21/11	Sun 4/3/11
41			**Aux. Gym, Locker Rooms System and Finishes**	**179 days**	**Mon 4/18/11**	**Thu 12/22/11**
42			Spray-on Fireproofing	5 days	Mon 4/18/11	Fri 4/22/11
43			Interior Masonry, Metal Frames and Studs	66 days	Mon 4/18/11	Mon 7/18/11
44			MEP Interior Rough-in	66 days	Mon 4/18/11	Mon 7/18/11
45			PA, Fire Alarm Installation	88 days	Sun 5/15/11	Tue 9/13/11
46			Pour Equipment Pads	2 days	Wed 5/25/11	Thu 5/26/11
47			Interior Finish &Painting	79 days	Wed 8/3/11	Mon 11/21/11
48			MEP Equipment Installation & Finish	98 days	Fri 5/27/11	Tue 10/11/11
49			Lighting	25 days	Wed 8/17/11	Tue 9/20/11
50			Flooring Systems	24 days	Wed 9/7/11	Mon 10/10/11
51			Equipment/ Casework	77 days	Wed 9/7/11	Thu 12/22/11
52			Final Cleaning	1 day	Tue 11/15/11	Tue 11/15/11
53			***Area B***	**409 days**	**Thu 9/9/10**	**Tue 4/3/12**
54			**Building Shell**	**321 days**	**Thu 9/9/10**	**Thu 12/1/11**
55			Reinforced Concrete Foundation Footings	25 days	Thu 9/9/10	Wed 10/13/10
56			Elevator Shaft/ Stair Tower Excavate/ Masonry	25 days	Thu 9/30/10	Wed 11/3/10
57			Slab on Grade	43 days	Thu 10/21/10	Mon 12/20/10
58			Erect Steel and Joists	26 days	Wed 12/29/10	Wed 2/2/11
59			Erect Metal Pan Stairs	16 days	Wed 12/29/10	Wed 1/19/11
60			Steel Bolt-up, Detailing	15 days	Thu 2/3/11	Wed 2/23/11
61			Steel Decking/ Studs	15 days	Thu 2/24/11	Wed 3/16/11
62			Install Equipment Curbs	5 days	Thu 3/17/11	Wed 3/23/11
63			CMU Backup Masonry	33 days	Thu 3/17/11	Mon 5/2/11
64			2nd Floor Slab on Deck	9 days	Wed 3/23/11	Mon 4/4/11
65			3rd Floor Slab on Deck	10 days	Tue 4/5/11	Mon 4/18/11
66			Metal Stud Back-up (1st, 2nd, 3rd flr.)	46 days	Tue 4/12/11	Tue 6/14/11
67			Set Roof-top Equipment	2 days	Thu 4/21/11	Fri 4/22/11
68			MEP Rooftop Connections	25 days	Mon 4/25/11	Fri 5/27/11



Project: PAMS Schedule
Date: Fri 10/21/11

Task	▬	Project Summary	▬	Inactive Milestone	◇	Manual Summary Rollup	▬	Deadline	⬇
Split	┈	External Tasks	▬	Inactive Summary	▭	Manual Summary	▬	Progress	▬
Milestone	◆	External Milestone	◆	Manual Task	▬	Start-only	[		
Summary	▬	Inactive Task	▭	Duration-only	▬	Finish-only	]		

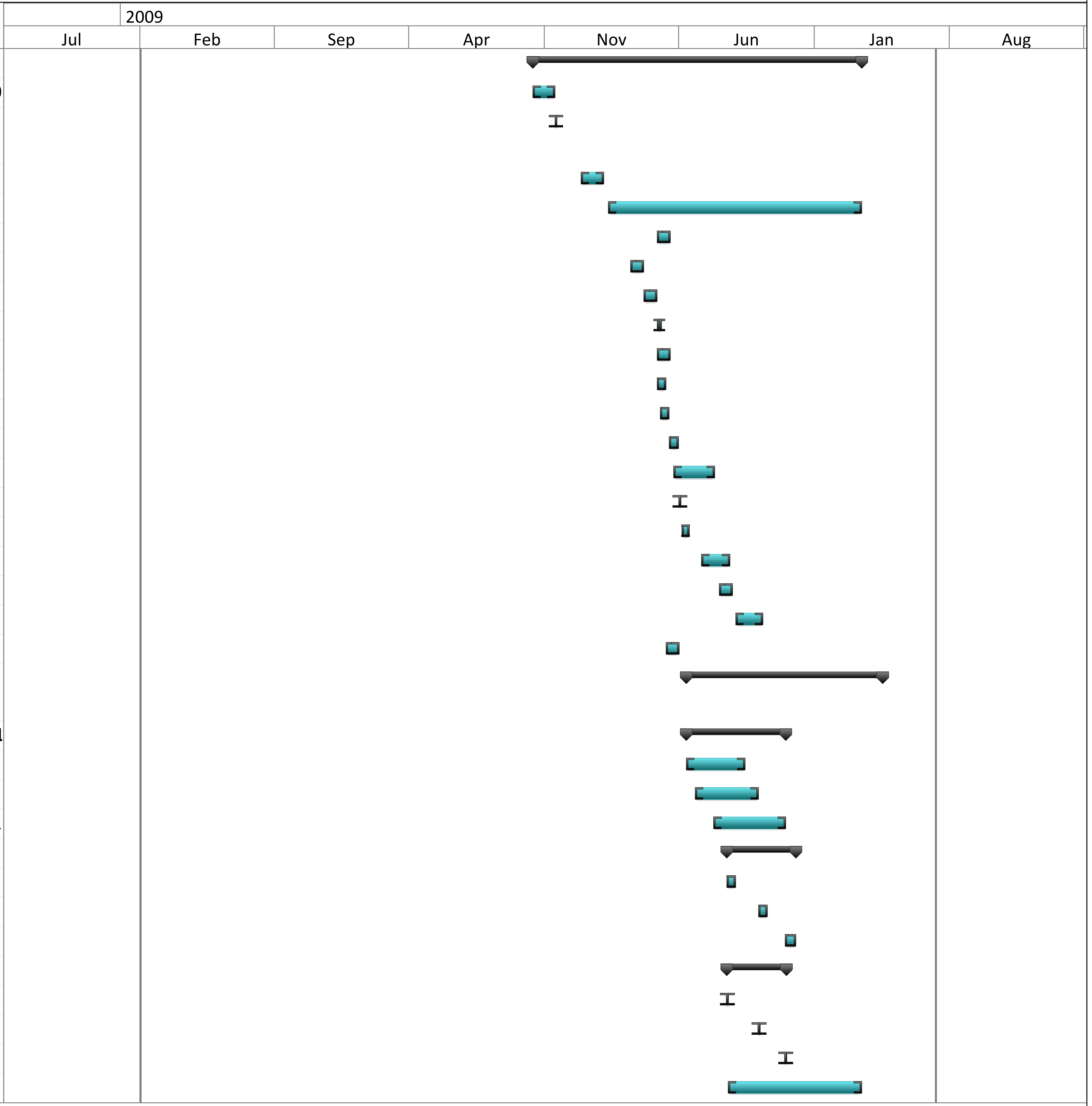
ID	ⓘ	Task Mode	Task Name	Duration	Start	Finish
69		📌	Masonry Veneer and Clean	40 days	Tue 5/24/11	Mon 7/18/11
70		📌	Metal Roofing	16 days	Wed 6/22/11	Wed 7/13/11
71		📌	Aluminum Entrances, Windows	30 days	Tue 7/19/11	Mon 8/29/11
72		📌	Insulation, Built-up Roofing	15 days	Thu 3/31/11	Wed 4/20/11
73		📌	Elevator Installation	23 days	Tue 11/1/11	Thu 12/1/11
74		⇨	**Classrooom, Kitchen Systems and Finishes**	**294 days**	**Wed 2/16/11**	**Tue 4/3/12**
75		⇨	**MEP Rough-in**	**103 days**	**Fri 4/29/11**	**Tue 9/20/11**
76		📌	Third Floor:	46 days	Fri 4/29/11	Fri 7/1/11
77		📌	Second Floor:	57 days	Fri 5/13/11	Mon 8/1/11
78		📌	First Floor:	77 days	Mon 6/6/11	Tue 9/20/11
79		⇨	**Interior Studs**	**46 days**	**Tue 7/5/11**	**Tue 9/6/11**
80		📌	Third Floor:	10 days	Tue 7/5/11	Mon 7/18/11
81		📌	Second Floor:	10 days	Tue 7/5/11	Mon 7/18/11
82		📌	First Floor:	11 days	Tue 8/23/11	Tue 9/6/11
83		⇨	**Pour Concrete Equipment Pads**	**37 days**	**Tue 7/5/11**	**Wed 8/24/11**
84		📌	Third Floor:	2 days	Tue 7/5/11	Wed 7/6/11
85		📌	Second Floor:	2 days	Tue 7/26/11	Wed 7/27/11
86		📌	First Floor:	2 days	Tue 8/23/11	Wed 8/24/11
87		📌	MEP Equipment Installation & Finish	0 days	Wed 2/16/11	Wed 2/16/11
88		⇨	**Interior Finish and Paint**	**94 days**	**Tue 8/16/11**	**Fri 12/23/11**
89		📌	Third Floor:	46 days	Tue 8/16/11	Tue 10/18/11
90		📌	Second Floor:	66 days	Tue 8/16/11	Tue 11/15/11
91		📌	First Floor:	58 days	Wed 10/5/11	Fri 12/23/11
92		📌	Casework	100 days	Wed 9/7/11	Tue 1/24/12
93		📌	Set Kitchen Equipment	15 days	Fri 1/27/12	Thu 2/16/12
94		📌	PA, Fire Alarm Installation	48 days	Wed 10/5/11	Fri 12/9/11
95		📌	Classroom Flooring	55 days	Wed 10/19/11	Tue 1/3/12
96		📌	Lighting Fixtures	49 days	Wed 9/28/11	Sat 12/3/11
97		📌	Final Cleaning	87 days	Mon 12/5/11	Tue 4/3/12
98		⇨	**Mechanical Room 1st/ 2nd Floor**	**154 days**	**Thu 4/21/11**	**Tue 11/22/11**
99		📌	MEP Rough-in	54 days	Thu 4/21/11	Tue 7/5/11
100		📌	PA, Alarm Installation	5 days	Thu 7/28/11	Wed 8/3/11
101		📌	Install MEP Equipment	84 days	Wed 7/6/11	Mon 10/31/11
102		📌	Hardware and Finishes	104 days	Thu 5/5/11	Tue 9/27/11
103		📌	Final Cleaning	16 days	Tue 11/1/11	Tue 11/22/11
104		⇨	***Area C***	**394 days**	**Thu 10/14/10**	**Tue 4/17/12**



Project: PAMS Schedule
Date: Fri 10/21/11

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

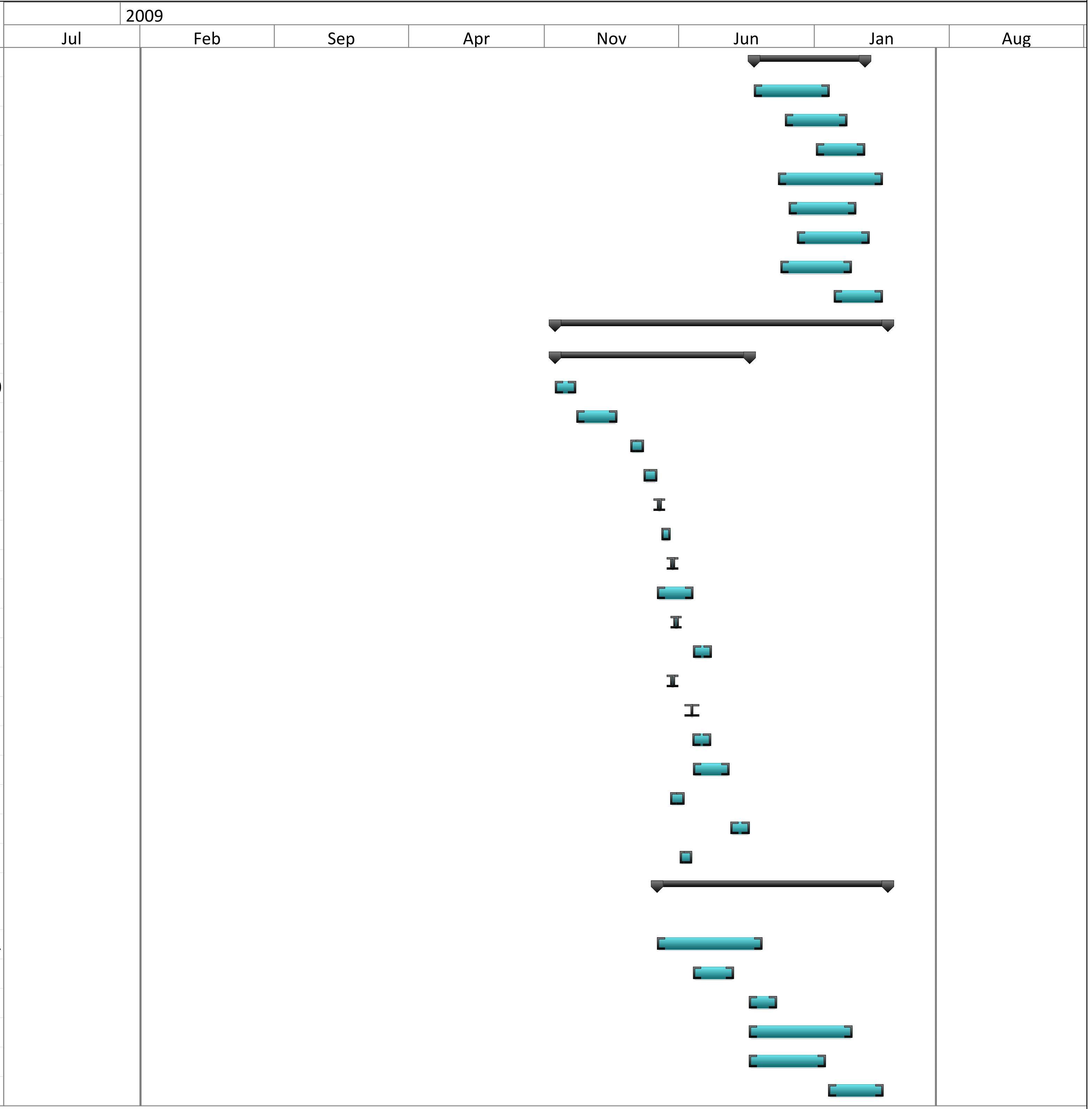
ID	ℹ	Task Mode	Task Name	Duration	Start	Finish
105			**Building Shell**	**371 days**	**Thu 10/14/10**	**Thu 3/15/12**
106			Reinforced Concrete Foundation Footings	25 days	Thu 10/14/10	Wed 11/17/10
107			Elevator Shaft/ Stair Tower Excavate/ Masonry	3 days	Thu 11/18/10	Sat 11/20/10
108			Slab on Grade	26 days	Wed 12/29/10	Wed 2/2/11
109			Erect Steel and Joists	286 days	Thu 2/10/11	Thu 3/15/12
110			Erect Metal Pan Stairs	15 days	Thu 4/28/11	Wed 5/18/11
111			Steel Bolt-up, Detailing	15 days	Thu 3/17/11	Wed 4/6/11
112			Steel Decking/ Studs	15 days	Thu 4/7/11	Wed 4/27/11
113			Install Equipment Curbs	5 days	Thu 4/28/11	Wed 5/4/11
114			CMU Backup Masonry	15 days	Thu 4/28/11	Wed 5/18/11
115			2nd Floor Slab on Deck	10 days	Thu 4/28/11	Wed 5/11/11
116			3rd Floor Slab on Deck	10 days	Tue 5/3/11	Mon 5/16/11
117			Metal Stud Back-up (1st, 2nd, 3rd flr.)	11 days	Tue 5/17/11	Tue 5/31/11
118			Set Roof-top Equipment	47 days	Tue 5/24/11	Wed 7/27/11
119			MEP Rooftop Connections	2 days	Thu 6/2/11	Fri 6/3/11
120			Masonry Veneer and Clean	10 days	Mon 6/6/11	Fri 6/17/11
121			Metal Roofing	33 days	Thu 7/7/11	Sat 8/20/11
122			Aluminum Entrances, Windows	15 days	Thu 8/4/11	Wed 8/24/11
123			Insulation, Built-up Roofing	31 days	Tue 8/30/11	Tue 10/11/11
124			Elevator Installation	15 days	Thu 5/12/11	Wed 6/1/11
125			**Classroom, Media Center Systems and Finishes**	**222 days**	**Mon 6/13/11**	**Tue 4/17/12**
126			**MEP Rough-in**	**113 days**	**Mon 6/13/11**	**Wed 11/16/11**
127			Third Floor:	67 days	Mon 6/13/11	Tue 9/13/11
128			Second Floor:	72 days	Mon 6/27/11	Tue 10/4/11
129			First Floor:	82 days	Tue 7/26/11	Wed 11/16/11
130			**Interior Studs**	**79 days**	**Tue 8/16/11**	**Fri 12/2/11**
131			Third Floor:	10 days	Tue 8/16/11	Mon 8/29/11
132			Second Floor:	10 days	Wed 10/5/11	Tue 10/18/11
133			First Floor:	13 days	Wed 11/16/11	Fri 12/2/11
134			**Pour Concrete Equipment Pads**	**68 days**	**Tue 8/16/11**	**Thu 11/17/11**
135			Third Floor:	2 days	Tue 8/16/11	Wed 8/17/11
136			Second Floor:	2 days	Wed 10/5/11	Thu 10/6/11
137			First Floor:	2 days	Wed 11/16/11	Thu 11/17/11
138			MEP Equipment Installation & Finish	151 days	Thu 8/18/11	Thu 3/15/12



Project: PAMS Schedule
Date: Fri 10/21/11

Task
Split
Milestone ◆
Summary
Project Summary
External Tasks
External Milestone ◆
Inactive Task
Inactive Milestone ◇
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only [
Finish-only]
Deadline ⇩
Progress

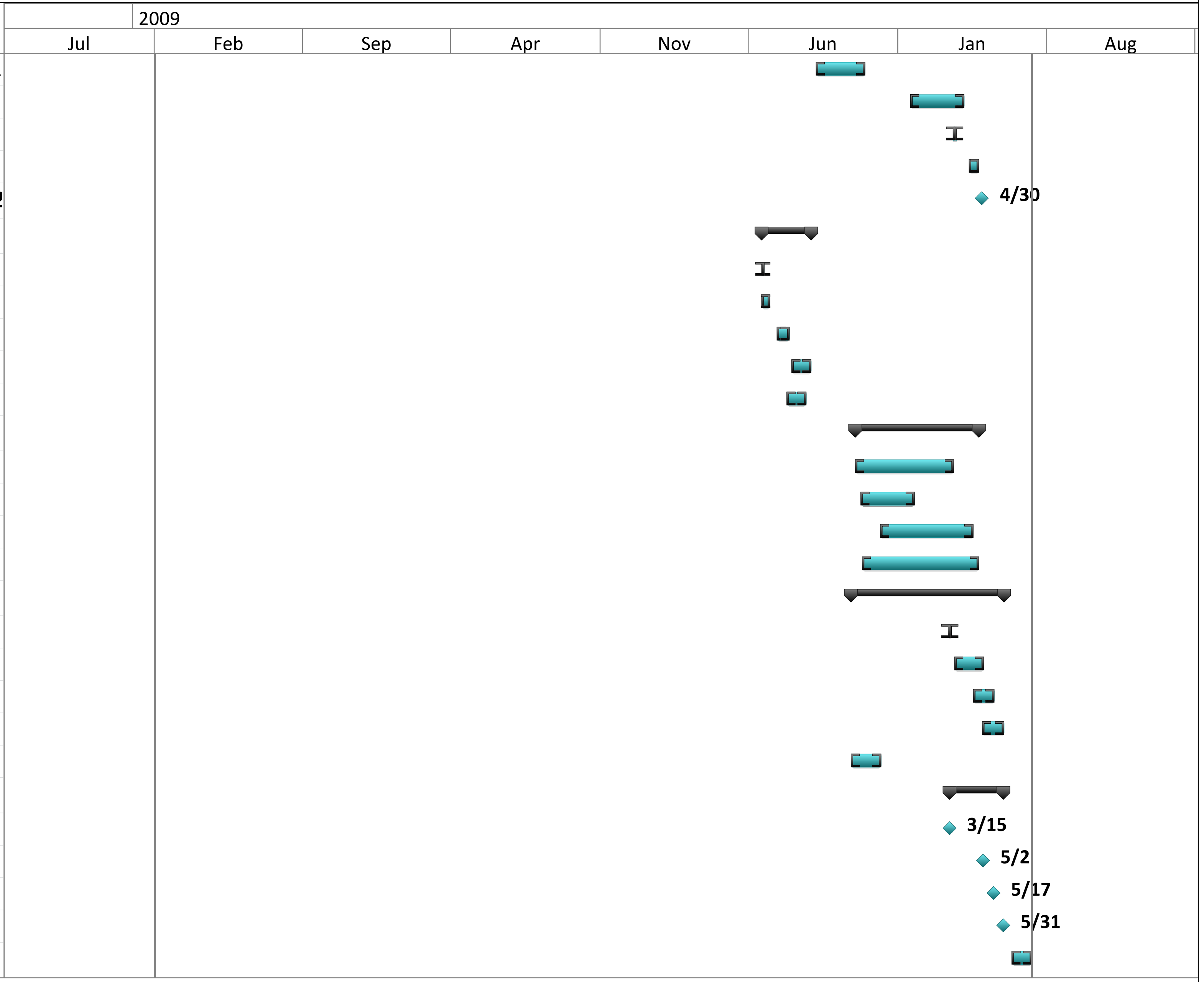
ID	ℹ	Task Mode	Task Name	Duration	Start	Finish
139			**Interior Finish and Paint**	**125 days**	**Wed 9/28/11**	**Tue 3/20/12**
140			Third Floor:	85 days	Wed 9/28/11	Tue 1/24/12
141			Second Floor:	70 days	Wed 11/16/11	Tue 2/21/12
142			First Floor:	55 days	Wed 1/4/12	Tue 3/20/12
143			Casework	118 days	Sat 11/5/11	Tue 4/17/12
144			PA, Fire Alarm Installation	76 days	Tue 11/22/11	Tue 3/6/12
145			Classroom Flooring	82 days	Mon 12/5/11	Tue 3/27/12
146			Lighting Fixtures	80 days	Wed 11/9/11	Tue 2/28/12
147			Final Cleaning	55 days	Wed 2/1/12	Tue 4/17/12
148			***Area D***	**375 days**	**Thu 11/18/10**	**Wed 4/25/12**
149			**Building Shell**	**219 days**	**Thu 11/18/10**	**Tue 9/20/11**
150			Reinforced Concrete Foundation Footings	23 days	Thu 11/18/10	Mon 12/20/10
151			Slab on Grade	46 days	Wed 12/22/10	Wed 2/23/11
152			Erect Steel and Joists	15 days	Thu 3/17/11	Wed 4/6/11
153			Steel Bolt-up, Detailing	15 days	Thu 4/7/11	Wed 4/27/11
154			Auditorium Risers	5 days	Thu 4/28/11	Wed 5/4/11
155			Steel Decking/ Studs	10 days	Thu 5/5/11	Wed 5/18/11
156			Install Equipment Curbs	5 days	Thu 5/19/11	Wed 5/25/11
157			Perimeter Masonry	41 days	Thu 4/28/11	Thu 6/23/11
158			2nd Floor Slab on Deck	6 days	Tue 5/24/11	Tue 5/31/11
159			Metal Pan Stairs	21 days	Fri 6/24/11	Fri 7/22/11
160			Metal Studs/ Wooden Framing	5 days	Thu 5/19/11	Wed 5/25/11
161			Set Roof-top Equipment	2 days	Tue 6/21/11	Wed 6/22/11
162			MEP Rooftop Connections	21 days	Thu 6/23/11	Thu 7/21/11
163			Masonry Veneer and Clean	41 days	Fri 6/24/11	Fri 8/19/11
164			Metal Roofing	16 days	Thu 5/19/11	Thu 6/9/11
165			Aluminum Entrances, Windows	22 days	Mon 8/22/11	Tue 9/20/11
166			Insulation, Built-up Roofing	13 days	Fri 6/3/11	Tue 6/21/11
167			**Auditorium, Music Classroom Systems and Finishes**	**260 days**	**Thu 4/28/11**	**Wed 4/25/12**
168			MEP Rough-in	118 days	Thu 4/28/11	Mon 10/10/11
169			Interior Studs, Masonry	46 days	Fri 6/24/11	Fri 8/26/11
170			Auditorium Sound System	32 days	Tue 9/20/11	Wed 11/2/11
171			MEP Equipment Installation & Finish	117 days	Tue 9/20/11	Wed 2/29/12
172			Interior Finish and Paint	87 days	Tue 9/20/11	Wed 1/18/12
173			Casework	63 days	Mon 1/23/12	Wed 4/18/12



Project: PAMS Schedule
Date: Fri 10/21/11

Task	▬	Project Summary	▬	Inactive Milestone	◇	Manual Summary Rollup	▬	Deadline	↓
Split	┈	External Tasks	▬	Inactive Summary	▭	Manual Summary	▬	Progress	▬
Milestone	◆	External Milestone	◆	Manual Task	▬	Start-only	[		
Summary	▬	Inactive Task	▭	Duration-only	▬	Finish-only	]		

ID	ℹ	Task Mode	Task Name	Duration	Start	Finish
174		📌	PA, Fire Alarm Installation	50 days	Tue 9/6/11	Mon 11/14/11
175		📌	Flooring	55 days	Thu 1/19/12	Wed 4/4/12
176		📌	Lighting Fixtures	1 day	Thu 3/22/12	Thu 3/22/12
177		📌	Final Cleaning	10 days	Thu 4/12/12	Wed 4/25/12
178		📌	**Substantial Completion**	***0 days***	***Mon 4/30/12***	***Mon 4/30/12***
179		⇨	**Final Site Work**	**51 days**	**Mon 6/20/11**	**Mon 8/29/11**
180		📌	Rough Grade Site	4 days	Mon 6/20/11	Thu 6/23/11
181		📌	Construct New Drop Off Loop	10 days	Mon 6/20/11	Fri 7/1/11
182		📌	Parking Lots, Driveways	14 days	Tue 7/12/11	Fri 7/29/11
183		📌	Sidewalks	20 days	Tue 8/2/11	Mon 8/29/11
184		📌	Spread Topsoil, Landscape & Seed	20 days	Tue 7/26/11	Mon 8/22/11
185		⇨	**Start Up, Testing and Balancing of Systems:**	**127 days**	**Tue 11/1/11**	**Wed 4/25/12**
186		📌	Area A	101 days	Tue 11/1/11	Tue 3/20/12
187		📌	Area B	55 days	Wed 11/9/11	Tue 1/24/12
188		📌	Area C	95 days	Wed 12/7/11	Tue 4/17/12
189		📌	Area D	119 days	Fri 11/11/11	Wed 4/25/12
190		⇨	**Prepare, Distribute, Work Punch List**	**157 days**	**Wed 10/26/11**	**Thu 5/31/12**
191		📌	Area A	1 day	Thu 3/15/12	Thu 3/15/12
192		📌	Area B	30 days	Thu 3/22/12	Wed 5/2/12
193		📌	Area C	22 days	Wed 4/18/12	Thu 5/17/12
194		📌	Area D	23 days	Tue 5/1/12	Thu 5/31/12
195		📌	Exterior Punchlist	31 days	Wed 10/26/11	Wed 12/7/11
196		⇨	**Complete Construction**	**55 days**	**Thu 3/15/12**	**Thu 5/31/12**
197		📌	Area A Complete	0 days	Thu 3/15/12	Thu 3/15/12
198		📌	Area B Complete	0 days	Wed 5/2/12	Wed 5/2/12
199		📌	Area C Complete	0 days	Thu 5/17/12	Thu 5/17/12
200		📌	Area D Complete	0 days	Thu 5/31/12	Thu 5/31/12
201		📌	**Occupy Middle School**	21 days	Tue 6/12/12	Tue 7/10/12



Project: PAMS Schedule
Date: Fri 10/21/11

Task	▬	Project Summary	▬	Inactive Milestone	◇	Manual Summary Rollup	▬	Deadline	↓
Split	┈	External Tasks	▬	Inactive Summary	▭	Manual Summary	▬	Progress	▬
Milestone	◆	External Milestone	◆	Manual Task	▬	Start-only	[		
Summary	▬	Inactive Task	▭	Duration-only	▬	Finish-only	]		

Detailed Structure Estimate

Foundation

Footing Type	Unit	Amount Area A	Amount Area B	Amount Area C	Amount Area D	Cubic Feet Concrete	Cubic Yards Concrete	Cost Per C.Y.	Cost Concrete
Perimeter Wall	l.f.	660	700	595	610	7695	285	$109.00	$31,996.95
Interior Wall	l.f.	555	150	165	450	3960	147	$109.00	$16,466.27
Column: F3.0	each	4	0	0	6	105	4	$109.00	$436.61
Column: F4.0	each	36	11	21	21	1661	62	$109.00	$6,908.07
Column: F5.0	each	16	7	5	11	1138	42	$109.00	$4,729.89
Column: F6.0	each	9	3	6	11	1392	52	$109.00	$5,788.14
Column: F7.0	each	6	12	5	6	2368	88	$109.00	$9,847.88
Column: F8.0	each	0	6	24	0	3520	130	$109.00	$14,636.68
Column: F9.0	each	0	9	5	6	3510	130	$109.00	$14,595.10
Column: F10.0	each	0	3	11	0	3267	121	$109.00	$13,583.28
Column: F11.0	each	0	1	0	0	303	11	$109.00	$1,257.84
Column: F12.0	each	4	7	4	0	6480	240	$109.00	$26,944.80

Table 1.1 - Shallow Concrete Foundation Estimate

Total Foundation Concrete Cost: $147,191.51

Footing Type	Length (ft.)	Width (ft.)	Depth (ft.)	Reinforcing
Perimeter Wall	-	3' 0"	1' 0"	(3) #5 Cont., (2) #5 @ 24"
Interior Wall	-	3' 0"	1' 0"	(3) #5 Cont., (2) #4 @ 24"
Column: F3.0	3' 0"	3' 0"	1' 2"	(3) #5 Bottom Both Ways
Column: F4.0	4' 0"	4' 0"	1' 2"	(4) #5 Bottom Both Ways
Column: F5.0	5' 0"	5' 0"	1' 2"	(5) #5 Bottom Both Ways
Column: F6.0	6' 0"	6' 0"	1' 4"	(8) #5 Bottom Both Ways
Column: F7.0	7' 0"	7' 0"	1' 8"	(7) #6 Bottom Both Ways
Column: F8.0	8' 0"	8' 0"	1' 10"	(9) #6 Bottom Both Ways
Column: F9.0	9' 0"	9' 0"	2' 2"	(11) #6 Bottom Both Ways
Column: F10.0	10' 0"	10' 0"	2' 4"	(8) #8 Bottom Both Ways
Column: F11.0	11' 0"	11' 0"	2' 6"	(10) #8 Bottom Both Ways
Column: F12.0	12' 0"	12' 0"	3' 0"	(11) #8 Bottom Both Ways

Table 1.2 - Footing Detail

Footing Type	Cubic Yards Concrete	Cost Per C.Y.	Cost Concrete
Perimeter Wall	285	$22.00	$6,458.10
Interior Wall	147	$22.00	$3,323.47
Column: F3.0	4	$22.00	$88.12
Column: F4.0	62	$22.00	$1,394.29
Column: F5.0	42	$22.00	$954.66
Column: F6.0	52	$22.00	$1,168.25
Column: F7.0	88	$22.00	$1,987.65
Column: F8.0	130	$22.00	$2,954.19
Column: F9.0	130	$22.00	$2,945.80
Column: F10.0	121	$22.00	$2,741.58
Column: F11.0	11	$22.00	$253.88
Column: F12.0	240	$22.00	$5,438.40

Table 1.3 – Concrete Footing Placement Estimate

Total Placement Cost:
$29,708.38

Footing Type	Unit	Wt. Rebar per unit (lbs)	Amount	Wt. Rebar per unit (tons)	Cost per ton	Cost Rebar
Perimeter Wall	l.f.	4.172	2565.000	5.351	$2,125	$11,370
Interior Wall	l.f.	3.797	1320.000	2.506	$2,125	$5,325
Column: F3.0	each	15.645	10.000	0.078	$2,125	$166
Column: F4.0	each	29.204	89.000	1.300	$2,125	$2,762
Column: F5.0	each	46.935	39.000	0.915	$2,125	$1,945
Column: F6.0	each	91.784	29.000	1.331	$2,125	$2,828
Column: F7.0	each	136.682	29.000	1.982	$2,125	$4,212
Column: F8.0	each	202.770	30.000	3.042	$2,125	$6,463
Column: F9.0	each	280.874	20.000	2.809	$2,125	$5,969
Column: F10.0	each	405.840	14.000	2.841	$1,575	$4,474
Column: F11.0	each	560.700	1.000	0.280	$1,575	$442
Column: F12.0	each	736.920	15.000	5.527	$1,575	$8,705

Table 1.4 – Concrete Footing Rebar Estimate

Total Rebar Cost: **$54,660**

Total Estimated Foundation Cost: $231,560.17

Concrete Slab on Grade

Region	Slab on Grade (S.F.)	Thickness (in.)	Concrete (Cub. Ft)	Concrete (C.Y.))	Unit Cost ($/C.Y.)	Cost Concrete ($)
A	33260	4	11086.66667	410.617284	$110.00	$45,167.90
B	31650	4	10550	390.7407407	$110.00	$42,981.48
C	21000	4	7000	259.2592593	$110.00	$28,518.52
D	25000	4	8333.333333	308.6419753	$110.00	$33,950.62

Table 2.1 Slab on Grade Concrete Estimate

Total Concrete Cost: $150,618.52

Region	Perimeter (L.F.)	Form Height (in.)	Unit Cost ($/S.F.C.A.)	Cost Forms ($)
A	660	8	4.64	2041.60
B	700	8	4.64	2165.33
C	595	8	4.64	1840.53
D	610	8	4.64	1886.93

Table 2.2 Slab on Grade Form Estimate

Total Form Cost: $7,934.40

Region	Area S.F.	Area 6x6 w2.9xw2.9 WWF (C.S.F.)	Unit Cost ($/C.S.F.)	Cost WWFs ($)
A	33260	332.6	66	21951.60
B	31650	316.5	66	20889.00
C	21000	210	66	13860.00
D	25000	250	66	16500.00

Table 2.3 Slab on Grade WWF Estimate

Total SOG WWF Cost: $73,200.60

Region	Concrete (CY)	Unit Cost ($/CY)	Cost of Placement ($)
A	410.62	$24.00	$9,854.81
B	390.74	$24.00	$9,377.78
C	259.26	$24.00	$6,222.22
D	308.64	$24.00	$7,407.41

Table 2.4 Slab on Grade WWF Estimate

Total SOG Placement Cost: $32,862.22

Total Estimated Slab on Grade Cost: $264,615.74

Composite Floor and Roof Deck

Region	A	B	C	D	Cost Per Unit	Cost Metal Deck
Deck Type	S.F.	S.F.	S.F.	S.F.	S.F.	$
F-1	2,400	32,450	40,880	6,825	$2.44	$201,434.20
R-1	50,231	27,950	21,700	33,150	$2.16	$287,346.96
R-2	14,175	0	625	1,200	$2.70	$43,200.00
R-3	3,400	0	4,900	0	$2.70	$22,410.00

Table 3.1 - Steel Floor and Roof Deck Estimate

Total Roof and Floor Deck Cost: $554,391.16

Region	A,B,C,D	Normal Weight Concrete Topping Thickness	Concrete	Unit Cost Concrete	Cost Concrete Topping
Deck Type	S.F.	Inches	C.Y.	$/C.Y.	$
F-1	82,555	3.5	891.80	$110.00	$98,097.76

Table 3.2 – Composite Floor Deck Concrete Topping Estimate

Total Cost Deck Concrete: $98,097.76

Area	A,B,C,D	N. Weight Concrete Topping Thickness	Concrete	Unit Cost Placement	Cost Placement
Deck Type	S.F.	Inches	C.Y.	$/C.Y.	$
F-1	82,555	3.5	891.80	$16.50	$14,714.66

Table 3.3 - Floor Deck Concrete Placement Estimate

Total Cost Place Deck Concrete: **$14,714.66**

Region	A,B,C,D	Concrete	6x6 w2.1xw2.1 WWF	Cost Deck Slab WWF
Deck Type	S.F.	C.S.F.	C.S.F	$/C.S.F.
F-1	82,555	825.55	61	$50,358.55

Table 3.4 - Floor Deck Concrete Mesh Estimate

Total SOG WWF Cost: **$50,358.55**

Total Estimated Composite Floor and Roof Deck: **$717,562.14**

Structural Steel Beams

	2nd Floor				3rd Floor				Roof				
Region	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**Total**
Beam Type	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**
w12x14	0	0	15	0	0	0	0	0	0	0	0	0	15
w12x26	0	0	273	0	0	0	0	0	0	0	0	154	427
w12x45	0	0	0	0	0	0	0	0	0	0	0	1390	1390
w12x72	0	0	0	0	0	0	0	0	2200	0	0	0	2200
w14x22	659	443	575	235	80	456	578	554	0	826	125	0	4531
w14x26	63	0	0	0	0	0	0	0	0	0	546	0	609
w14x30	0	0	0	0	0	0	0	168	0	0	0	0	168
w16x26	374	13	0	36	38	0	14	47	0	0	0	70	592
w16x31	0	230	0	0	0	0	0	0	0	0	163	0	393
w16x36	0	0	0	81	0	0	0	0	210	0	0	37	328
w18x35	349	236	39	0	167	0	0	0	0	615	977	224	2607
w18x40	98	1875	2100	21	219	2190	2775	0	0	0	0	0	9277
w18x46	0	0	0	82	44	0	0	0	0	0	198	0	324
w18x50	222	0	0	0	0	0	0	202	0	0	0	0	424
w18x76	0	0	0	0	0	0	0	0	100	0	0	0	100
w18x97	0	0	0	0	0	0	0	0	130	0	0	0	130
w21x44	1005	1345	240	698	27	158	208	1614	0	0	0	201	5495
w21x50	74	165	237	40	15	134	233	0	0	131	66	918	2012
w21x57	221	0	0	0	0	0	0	0	0	0	0	0	221
w21x62	0	0	0	78	0	0	0	0	0	0	0	1390	1468
w21x68	28	0	0	0	0	0	0	0	0	0	0	0	28
w21x83	0	34	0	0	0	34	0	0	0	0	0	0	67
w24x55	498	539	0	60	0	45	140	0	0	0	0	0	1282
w24x62	125	151	172	0	0	101	0	0	0	0	0	0	549
w24x68	0	0	0	0	0	0	0	75	0	0	0	0	75
w24x76	0	34	0	25	0	0	0	0	0	0	0	0	59
w24x94	0	36	0	0	0	0	0	0	0	0	0	0	36
w27x94	0	0	30	0	0	61	0	0	0	0	0	0	91
w30x99	0	0	0	0	0	0	0	0	0	0	0	45	45
wT7x21.5	0	0	0	0	38	0	0	0	0	0	0	0	38
T-wT5x15	0	0	0	0	0	0	0	0	2320	0	0	0	2320
L5x5x3/8	0	0	0	0	0	0	0	0	10400	0	0	0	10400
L6x6x3/8	0	0	0	0	0	0	0	0	0	0	0	1700	1700
HSS4x4x3/8	329	0	158	190	0	0	0	0	0	0	0	0	677
HSS4X4X5/16	0	4	0	0	0	0	0	0	0	0	0	0	4
HSS6x4x3/8	1897	0	252	286	0	0	0	0	0	0	0	0	2435

HSS6x4x5/16	48	0	0	0	0	0	0	0	0	0	0	0	48
HSS6x8x3/8	0	135	0	0	0	0	0	0	0	0	0	3434	3569
HSS8x6x5/16	0	0	0	0	45	0	0	0	0	0	0	0	45
HSS8x8x3/8	27	0	0	0	0	0	0	0	0	0	0	0	27
HSS10x8x3/8	164	0	47	66	0	0	0	0	0	0	0	0	277
HSS12x12x3/8	0	0	0	0	0	0	0	45	0	0	0	0	45
HSS16x12x5/8	27	0	0	0	0	0	0	0	0	0	0	0	27
HSS20x8x1/2	0	121	0	0	0	0	80	0	0	0	0	0	201
16KSP	0	0	0	0	0	0	0	410	0	0	0	0	410
22K10	0	0	0	0	570	0	0	0	0	0	0	0	570
24K7	0	0	0	0	0	0	0	0	0	2733	1953	0	4685
24KSP	0	0	0	0	0	0	440	0	0	0	0	0	440
30K9	0	0	0	0	0	0	0	0	0	0	820	0	820
24" Barrel Jst.	0	0	0	0	0	0	30	0	0	0	0	0	30
36" Barrel Jst.	0	304	0	0	0	0	0	0	0	0	0	0	304

Table 4.1 Structural Steel Beams Linear Footage

Table 4.2 Structural Steel Beam Cost Calculation

Beam Type	Total Length	Cost Per Foot	Total Cost
w12x14	15.0	25.00	$375.00
w12x26	427.0	42.50	$18,147.50
w12x45	1390.0	73.00	$101,470.00
w12x72	2200.0	108.00	$237,600.00
w14x22	4531.0	38.00	$172,178.00
w14x26	608.5	42.00	$25,557.00
w14x30	168.0	48.00	$8,064.00
w16x26	591.9	42.00	$24,859.80
w16x31	393.0	49.00	$19,257.00
w16x36	328.0	80.25	$26,322.00
w18x35	2607.3	56.50	$147,312.45
w18x40	9277.4	63.50	$589,114.90
w18x46	324.2	71.50	$23,180.30
w18x50	423.5	77.50	$32,821.25
w18x76	100.0	112.00	$11,200.00
w18x97	130.0	139.50	$18,135.00
w21x44	5495.3	68.00	$373,680.40
w21x50	2012.3	76.00	$152,937.08
w21x57	221.0	84.25	$18,619.25
w21x62	1468.0	92.50	$135,790.00
w21x68	27.8	101.00	$2,807.80

Table 4.2 Continued

Beam Type	Total Length	Cost Per Foot($)	Total Cost
w21x83	67.2	122.00	$8,198.40
w24x55	1282.1	82.50	$0.00
w24x62	548.7	92.00	$0.00
W24x68	75.0	100.00	$0.00
w24x76	59.0	111.00	$6,549.00
w24x94	36.2	136.00	$4,923.20
w27x94	91.0	135.00	$12,285.00
w30x99	45.0	142.00	$6,390.00
dbl. T-wT5x15	2320.0	68.10	$157,992.00
L5x5x3/8	10400.0	10.20	$106,051.56
L6x6x3/8	1700.0	9.43	$16,037.11
HSS4x4x3/8	677.0	26.25	$17,771.25
HSS4X4X5/16	4.0	26.25	$105.00
HSS6x4x3/8	2435.0	42.61	$103,753.83
HSS6x4x5/16	48.0	37.50	$1,800.00
HSS6x8x3/8	3568.7	52.46	$187,199.73
HSS8x6x5/16	45.0	59.93	$2,696.67
HSS8x8x3/8	26.7	60.71	$1,621.07
HSS10x8x3/8	277.3	70.88	$19,655.58
HSS12x12x3/8	45.0	98.02	$4,410.90
HSS16x12x5/8	26.7	182.60	$4,875.42
HSS20x8x1/2	201.4	91.68	$18,464.35
16KSP	410.0	10.50	$4,305.00
22K10	570.0	12.90	$7,353.00
24K7	4685.0	11.50	$53,877.96
24KSP	440.0	11.50	$5,060.00
30K9	820.0	13.70	$11,234.00
24" Barrel Joist	30.0	28.00	$840.00
36" Barrel Joist	304.0	36.00	$10,944.00

Nominal Structural Steel Beam Cost:	$3,077,576.41
+10%	$307,757.64
Total Estimated Structural Steel Beam Cost:	$3,385,334.05

Structural Steel Columns

	1st Floor				2nd Floor				3rd Floor				
Region	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**Total Length**
Column Type	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**	**L.F.**
w8x48	0	0	56	0	0	0	56	0	0	0	0	0	112
w12x53	161	0	0	28	161	0	0	28	161	0	0	28	568
w12x65	117	0	0	126	117	0	0	126	117	0	0	126	730
w12x72	15	0	0	42	15	0	0	42	15	0	0	42	170
w12x79	0	0	0	70	0	0	0	70	0	0	0	70	210
w12x120	0	0	0	42	0	0	0	42	0	0	0	42	126
HSS6x6x3/8	30	0	0	28	0	0	0	28	0	0	0	28	114
HSS8x8x3/8	777	378	560	546	168	322	560	490	0	322	504	154	4781
HSS8x8x1/2	29	252	238	14	0	196	238	14	0	196	238	14	1429
HSS8x8x5/8	0	98	14	0	0	98	14	0	0	98	14	0	336

Table 5.1 Structural Steel Column Total Length

	Total Length	**Unit Cost**	**Total Cost**
Column Type	**L.F.**	**$/L.F.**	**$**
w8x48	112	$77.00	$8,624.00
w12x53	568	$82.50	$46,860.01
w12x65	730	$95.25	$69,532.51
w12x72	170	$108.00	$18,361.08
w12x79	210	$116.00	$24,360.00
w12x120	126	$145.00	$18,270.00
HSS6x6x3/8	114	$32.14	$3,664.29
HSS8x8x3/8	4781	$60.71	$290,295.24
HSS8x8x1/2	1429	$79.05	$112,990.23
HSS8x8x5/8	336	$94.92	$31,894.13

Table 5.2 Structural Steel Column Cost

Nominal Structural Steel Column Cost:	**$624,851.48**
+ 10%	**$62,485.15**
Total Estimated Structural Steel Column Cost:	**$687,336.63**

Overall Structural Estimate

Estimated Foundation Cost	**$231,560.17**
Estimated Slab on Grade Cost	**$264,615.74**
Estimated Elevated Slabs/ Deck Cost	**$717,562.14**
Estimated Structural Steel Beam Cost	**$3,385,334.05**
Estimated Structural Steel Column Cost:	**$687,336.63**

Total Estimated Cost of Structure: $5,286,408.73

RS Means Values Used:

Form Decking 05 31 33.50	Formwork Concrete 03 11 13.65
Roof Decking 05 31 23.50	Cast – in – Place Concrete 03 30 53.40
Open Web Steel Joist 05 12 23.75	Reinforcement Bar 03 21 10.60
Structural Steel Columns 05 12 23.17	Placement Concrete 03 30 53.40

General Conditions Estimate

Item	Unit Rate	Unit	Quantity	Project Cost
Temporary Facilities	$ 66,000.00	Each	1	$ 66,000.00
Temporary Utilities	$ 720.00	Weeks	100	$ 72,000.00
Temporary Fencing	$ 320.00	Weeks	100	$ 32,000.00
Temporary Protection	$ 600.00	Weeks	100	$ 60,000.00
Dumpsters/ Hauling	$ 840.00	Weeks	100	$ 84,000.00
Broom Sweep Building (laborer)	$ 640.00	Weeks	100	$ 64,000.00
General Administration/ Postage/ Copies	$ 288.00	Weeks	100	$ 28,800.00
Project Staff	$ 4,215.60	Weeks	100	$421,560.00
Fringes / Taxes / Insurance				$193,703.00

Table 1: General Condition Estimate

Total General Conditions Cost: $ 1,022,063.00

Contingency Cost

Contingency Cost	Cost
Design/ Development	$ 275,000.00
Construction	$ 1,375,000.00
Total Contingency Cost	$ 1,650,000.00

Table 2: Contingency Cost

On-Site Staff Positions and Wage Rates

Staff Position	Base Monthly	Hourly Billing
On-Site Construction Manager	$ 8,782.50	$ 75.96
Project Manager (half-time)	$ 4,724.00	$ 81.71
Assistant Project Manager (half-time)	$ 4,058.50	$ 70.20

Table 3: Onsite Staff Rates

*Costs for general conditions items come from conversation with contractor. Publication of cost breakdown associate

LEED 2009 for New Construction and Major Renovations

Project Checklist

Phoenixville Area Middle School

10/17/2011

20 0 6

Sustainable Sites

Possible Points: **26**

Y	?	N	d/C					Notes:
Y			C	Prereq 1		Construction Activity Pollution Prevention		Phase I and II Environment Testing Performed
1			d	Credit 1		Site Selection	1	Proposed Site On Existing School Campus
5			d	Credit 2		Development Density and Community Connectivity	5	Option 1 Satisfied
		1	d	Credit 3		Brownfield Redevelopment	1	
6		0	d	Credit 4.1		Alternative Transportation—Public Transportation Access	6	School Buses
1			d	Credit 4.2		Alternative Transportation—Bicycle Storage and Changing Rooms	1	Bike Racks, Showers in Locker Rooms
3			d	Credit 4.3		Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3	Parking Provided for Fuel-Efficient Vehicles
		2	d	Credit 4.4		Alternative Transportation—Parking Capacity	2	
		1	C	Credit 5.1		Site Development—Protect or Restore Habitat	1	
		1	d	Credit 5.2		Site Development—Maximize Open Space	1	
1			d	Credit 6.1		Stormwater Design—Quantity Control	1	Stormwater will accommodate the two year storm event
1			d	Credit 6.2		Stormwater Design—Quality Control	1	for rate and quantity. DEP Requirement.
		1	C	Credit 7.1		Heat Island Effect—Non-roof	1	
1			d	Credit 7.2		Heat Island Effect—Roof	1	Flat Roofs to be White
1			d	Credit 8		Light Pollution Reduction	1	Dark Sky Compliant Fixtures and Bollard Lights

6 0 4

Water Efficiency

Possible Points: **10**

Y	?	N						Notes:
Y			d	Prereq 1		Water Use Reduction—20% Reduction		
4			d	Credit 1		Water Efficient Landscaping	2 to 4	
					1	Reduce by 50%	2	
					1	No Potable Water Use or Irrigation	4	No Landscape Irrigation System
		2	d	Credit 2		Innovative Wastewater Technologies	2	
2		2	d	Credit 3		Water Use Reduction	2 to 4	Waterless urinals, 0.5 GPM hand wash fountains, 1.0
					2	Reduce by 30%	2	Classroom Sinks, 1.0 GPM Toilets, 1.8 GPM Showerheads
						Reduce by 35%	3	
						Reduce by 40%	4	

6 2 27

Energy and Atmosphere

Possible Points: **35**

Y	?	N						Notes:
Y			C	Prereq 1		Fundamental Commissioning of Building Energy Systems		
Y			d	Prereq 2		Minimum Energy Performance		
Y			d	Prereq 3		Fundamental Refrigerant Management		
4		15	d	Credit 1		Optimize Energy Performance	1 to 19	Water Source Heat Pumps, Heat Recovery Units
						Improve by 12% for New Buildings or 8% for Existing Building Renovations	1	
						Improve by 14% for New Buildings or 10% for Existing Building Renovations	2	
						Improve by 16% for New Buildings or 12% for Existing Building Renovations	3	
					Y	Improve by 18% for New Buildings or 14% for Existing Building Renovations	4	
						Improve by 20% for New Buildings or 16% for Existing Building Renovations	5	
						Improve by 22% for New Buildings or 18% for Existing Building Renovations	6	
						Improve by 24% for New Buildings or 20% for Existing Building Renovations	7	
						Improve by 26% for New Buildings or 22% for Existing Building Renovations	8	
						Improve by 28% for New Buildings or 24% for Existing Building Renovations	9	
						Improve by 30% for New Buildings or 26% for Existing Building Renovations	10	
						Improve by 32% for New Buildings or 28% for Existing Building Renovations	11	
						Improve by 34% for New Buildings or 30% for Existing Building Renovations	12	
						Improve by 36% for New Buildings or 32% for Existing Building Renovations	13	
						Improve by 38% for New Buildings or 34% for Existing Building Renovations	14	
						Improve by 40% for New Buildings or 36% for Existing Building Renovations	15	
						Improve by 42% for New Buildings or 38% for Existing Building Renovations	16	
						Improve by 44% for New Buildings or 40% for Existing Building Renovations	17	
						Improve by 46% for New Buildings or 42% for Existing Building Renovations	18	
						Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19	
		7	d	Credit 2		On-Site Renewable Energy	1 to 7	
						1% Renewable Energy	1	
						3% Renewable Energy	2	
						5% Renewable Energy	3	
						7% Renewable Energy	4	
						9% Renewable Energy	5	
						11% Renewable Energy	6	
						13% Renewable Energy	7	
		2	C	Credit 3		Enhanced Commissioning	2	
2			d	Credit 4		Enhanced Refrigerant Management	2	
		3	C	Credit 5		Measurement and Verification	3	
	2		C	Credit 6		Green Power	2	Will be earned if school purchases power from renewable
								resources. Determined post occupancy.

6 0 8

Materials and Resources

Possible Points: **14**

Y	?	N						Notes:
Y			d	Prereq 1		Storage and Collection of Recyclables		
		3	C	Credit 1.1		Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3	
						Reuse 55%	1	
						Reuse 75%	2	
						Reuse 95%	3	
		1	C	Credit 1.2		Building Reuse—Maintain 50% of Interior Non-Structural Elements	1	
2			C	Credit 2		Construction Waste Management	1 to 2	
					x	50% Recycled or Salvaged	1	
					x	75% Recycled or Salvaged	2	
		2	C	Credit 3		Materials Reuse	1 to 2	
						Reuse 5%	1	

					☐ Reuse 10%	2	
2			c	Credit 4	Recycled Content	1 to 2	
					x 10% of Content	1	
					x 20% of Content	2	
2			c	Credit 5	Regional Materials	1 to 2	
					x 10% of Materials	1	
					x 20% of Materials	2	
		1	c	Credit 6	Rapidly Renewable Materials	1	
		1	c	Credit 7	Certified Wood	1	

12	0	3			**Indoor Environmental Quality**	Possible Points: **15**	
Y	?	N					Notes:
Y			d	Prereq 1	Minimum Indoor Air Quality Performance		
Y			d	Prereq 2	Environmental Tobacco Smoke (ETS) Control		
1			d	Credit 1	Outdoor Air Delivery Monitoring	1	
		1	d	Credit 2	Increased Ventilation	1	
1			c	Credit 3.1	Construction IAQ Management Plan—During Construction	1	
1			c	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1	
1			c	Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1	
1			c	Credit 4.2	Low-Emitting Materials—Paints and Coatings	1	
1			c	Credit 4.3	Low-Emitting Materials—Flooring Systems	1	
		1	c	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1	
		1	d	Credit 5	Indoor Chemical and Pollutant Source Control	1	
1			d	Credit 6.1	Controllability of Systems—Lighting	1	Motion Sensors Each Room
1			d	Credit 6.2	Controllability of Systems—Thermal Comfort	1	Individual Temperature Control Each Room
1			d	Credit 7.1	Thermal Comfort—Design	1	System Complies with ASHRAE 55
1			d	Credit 7.2	Thermal Comfort—Verification	1	Post-Occupancy Survey at 6 and 18 Months
1			d	Credit 8.1	Daylight and Views—Daylight	1	
1			d	Credit 8.2	Daylight and Views—Views	1	

4	0	2			**Innovation and Design Process**	Possible Points: **6**	
Y	?	N					Notes:
1			d/C	Credit 1.1	Innovation in Design: Exemplary Performance MRc5	1	
1			d/C	Credit 1.2	Innovation in Design: Green Building Education	1	
1			d/C	Credit 1.3	Innovation in Design: School as a Teach Tool	1	
		1	d/C	Credit 1.4	Innovation in Design: Specific Title		
		1	d/C	Credit 1.5	Innovation in Design: Specific Title	1	
1			d/C	Credit 2	LEED Accredited Professional	1	

0	0	4			**Regional Priority Credits**	Possible Points: **4**	
Y	?	N					Notes:
		1	d/C	Credit 1.1	Regional Priority: Specific Credit	1	
		1	d/C	Credit 1.2	Regional Priority: Specific Credit	1	
		1	d/C	Credit 1.3	Regional Priority: Specific Credit	1	
		1	d/C	Credit 1.4	Regional Priority: Specific Credit	1	

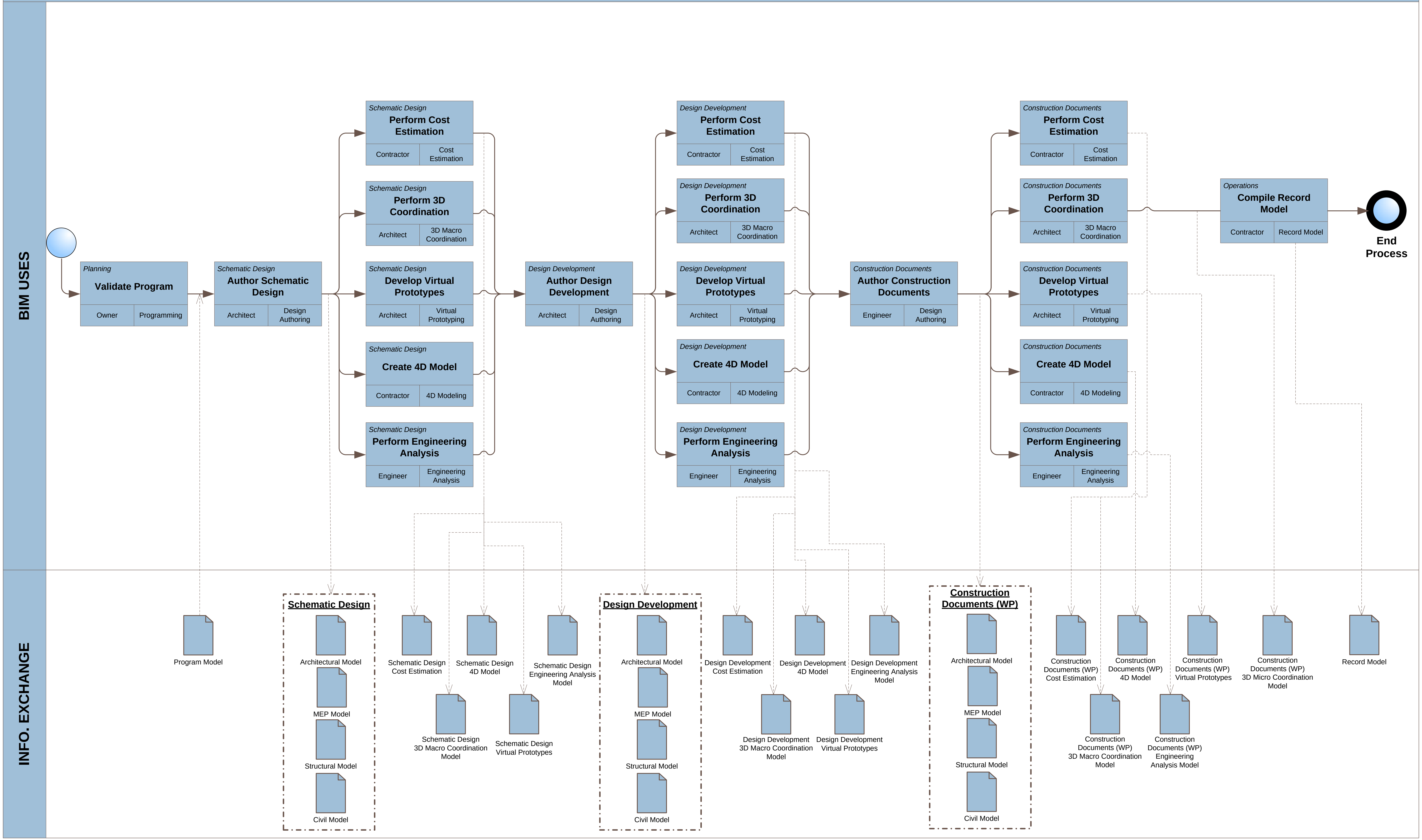
54	2	54	**Total**	Possible Points: **110**

Certified 40 to 49 points   Silver 50 to 59 points   Gold 60 to 79 points   Platinum 80 to 110

Level 1: BIM Execution Planning Process

Project Title

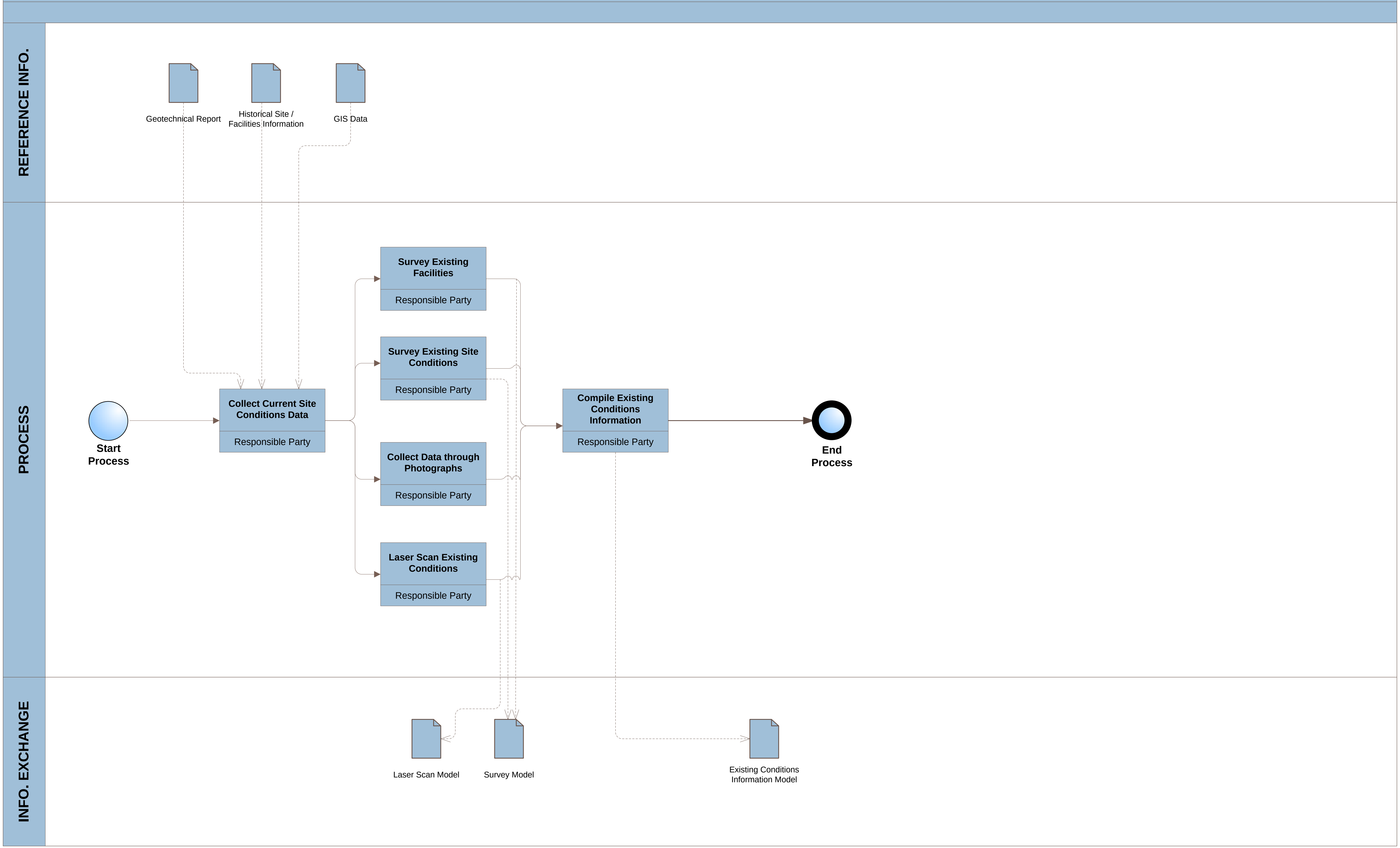
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Existing Conditions Modeling

Project Title

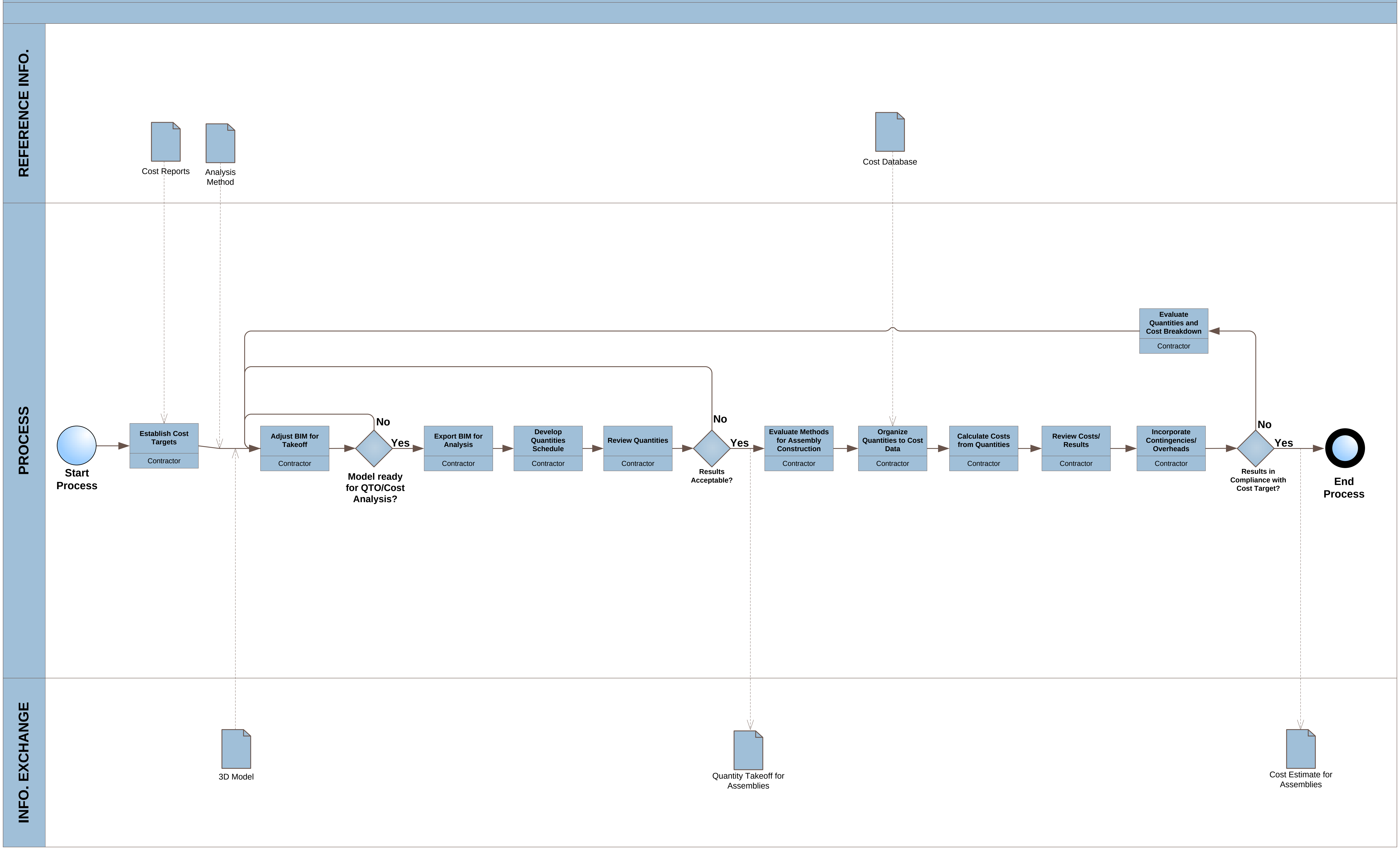
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Cost Estimation

Project Title

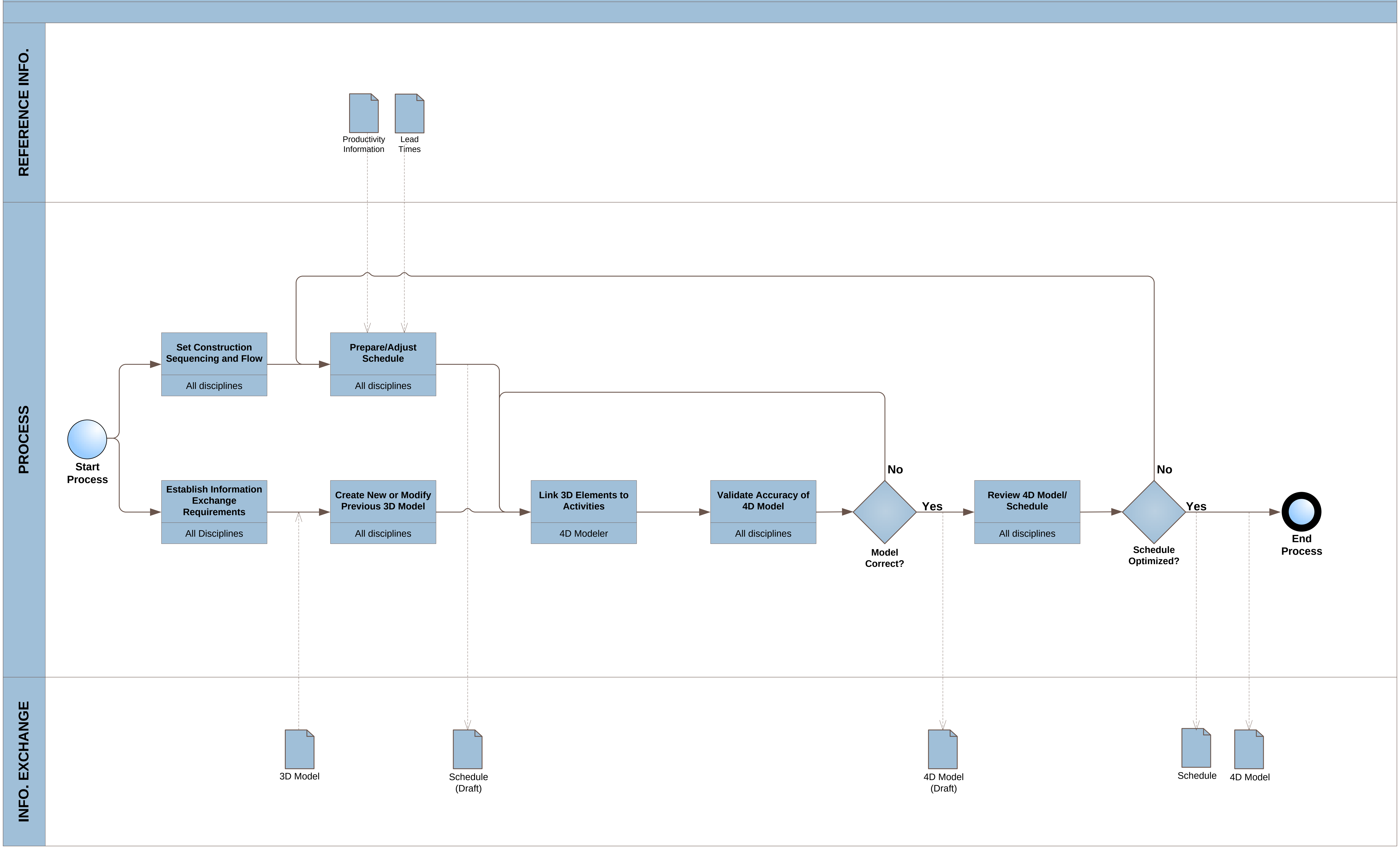
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: 4D Modeling

Project Title

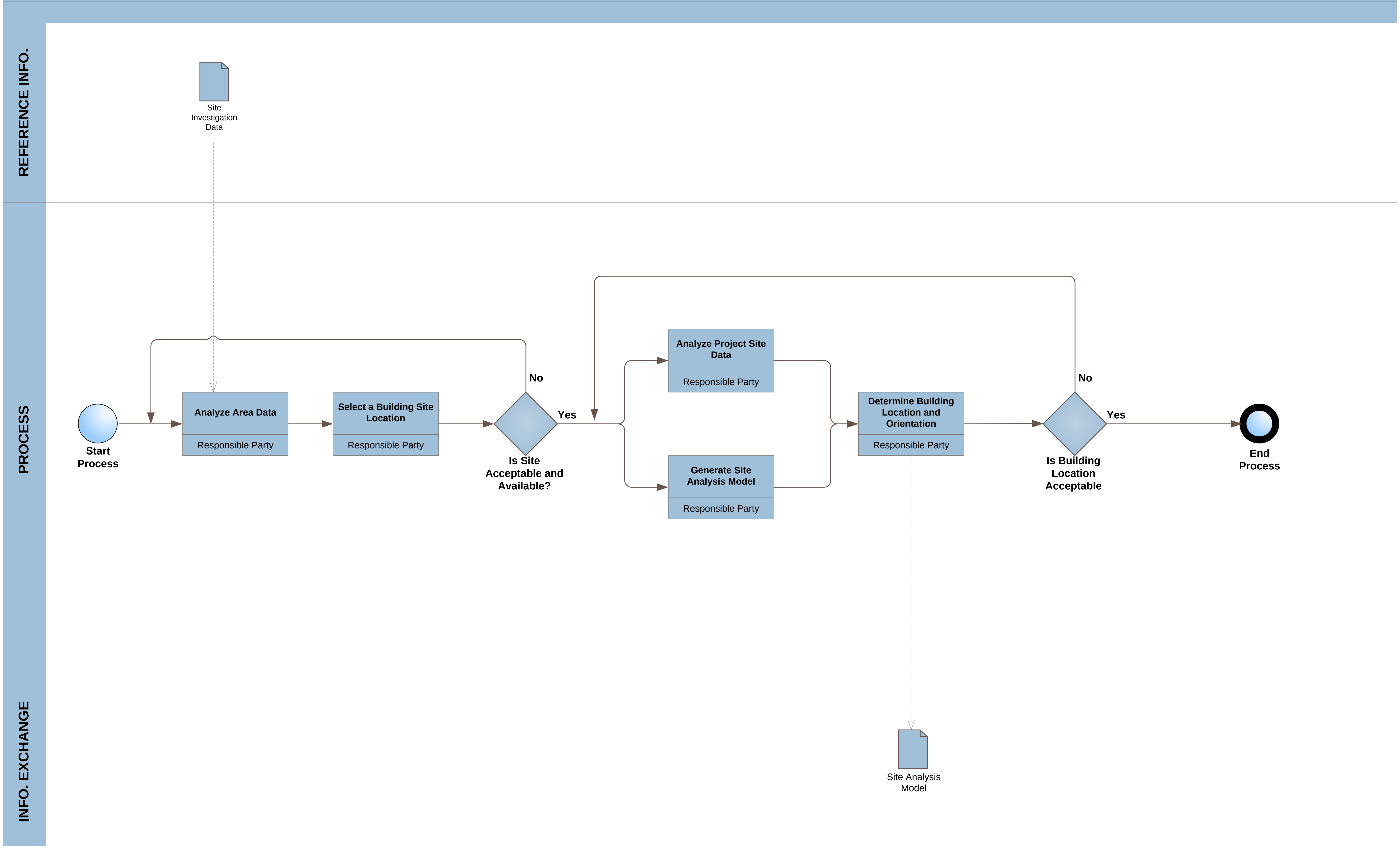
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Site Analysis

Project Title

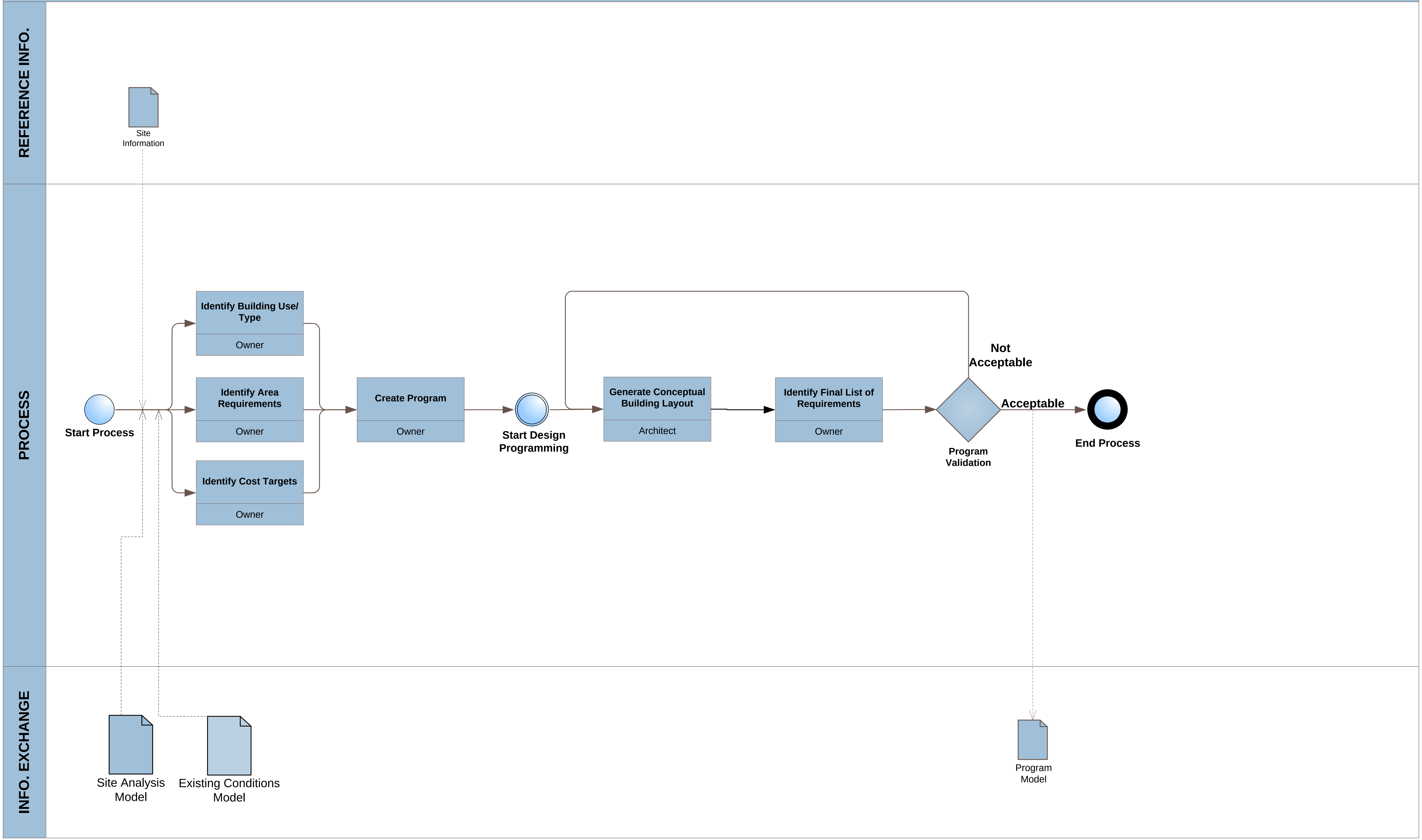
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Programming

Project Title

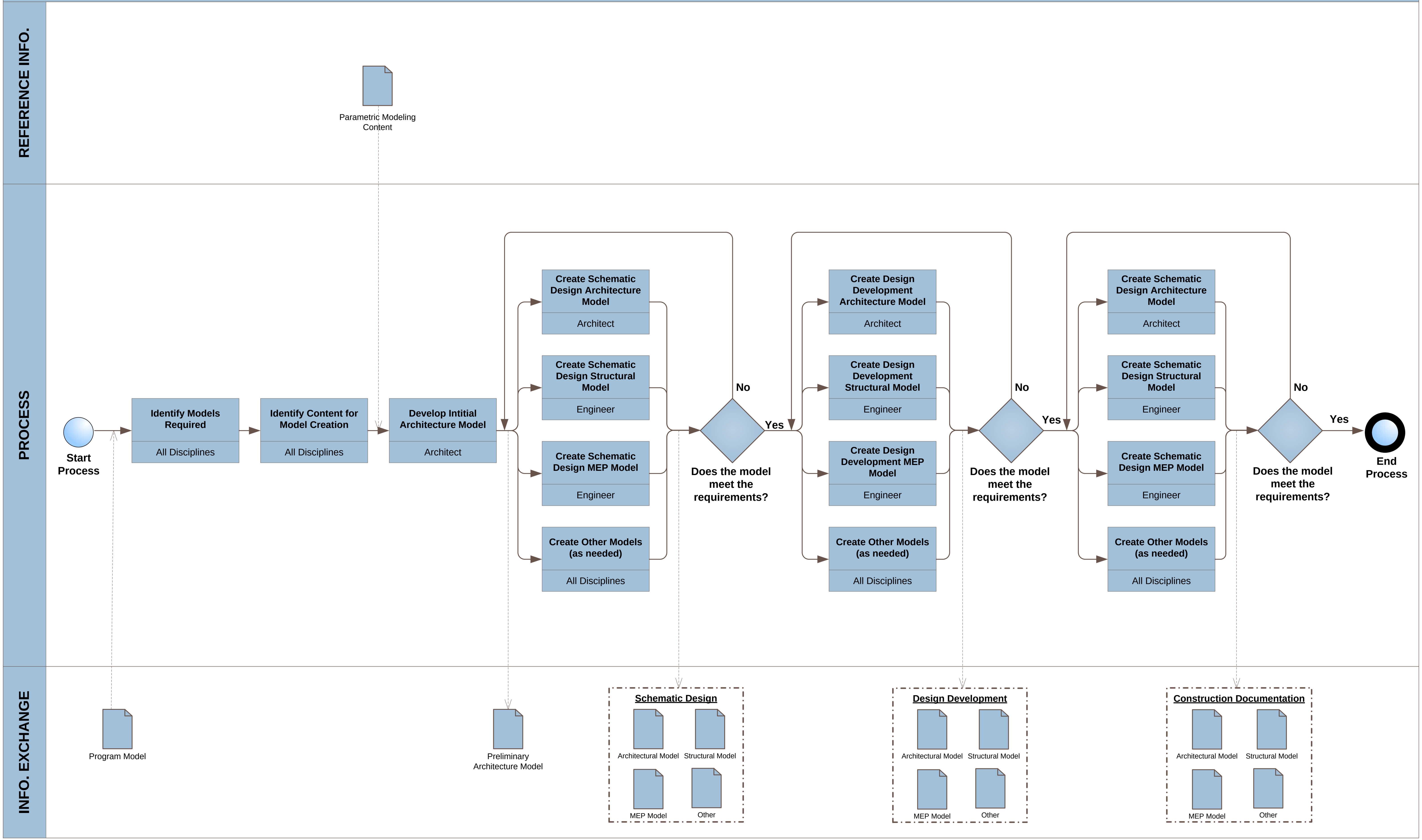
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Design Authoring

Project Title

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



REFERENCE INFO.

Parametric Modeling Content

PROCESS

Start Process

Identify Models Required
All Disciplines

Identify Content for Model Creation
All Disciplines

Develop Intitial Architecture Model
Architect

Create Schematic Design Architecture Model
Architect

Create Schematic Design Structural Model
Engineer

Create Schematic Design MEP Model
Engineer

Create Other Models (as needed)
All Disciplines

Does the model meet the requirements?
No
Yes

Create Design Development Architecture Model
Architect

Create Design Development Structural Model
Engineer

Create Design Development MEP Model
Engineer

Create Other Models (as needed)
All Disciplines

Does the model meet the requirements?
No
Yes

Create Schematic Design Architecture Model
Architect

Create Schematic Design Structural Model
Engineer

Create Schematic Design MEP Model
Engineer

Create Other Models (as needed)
All Disciplines

Does the model meet the requirements?
No
Yes

End Process

INFO. EXCHANGE

Program Model

Preliminary Architecture Model

Schematic Design
Architectural Model
Structural Model
MEP Model
Other

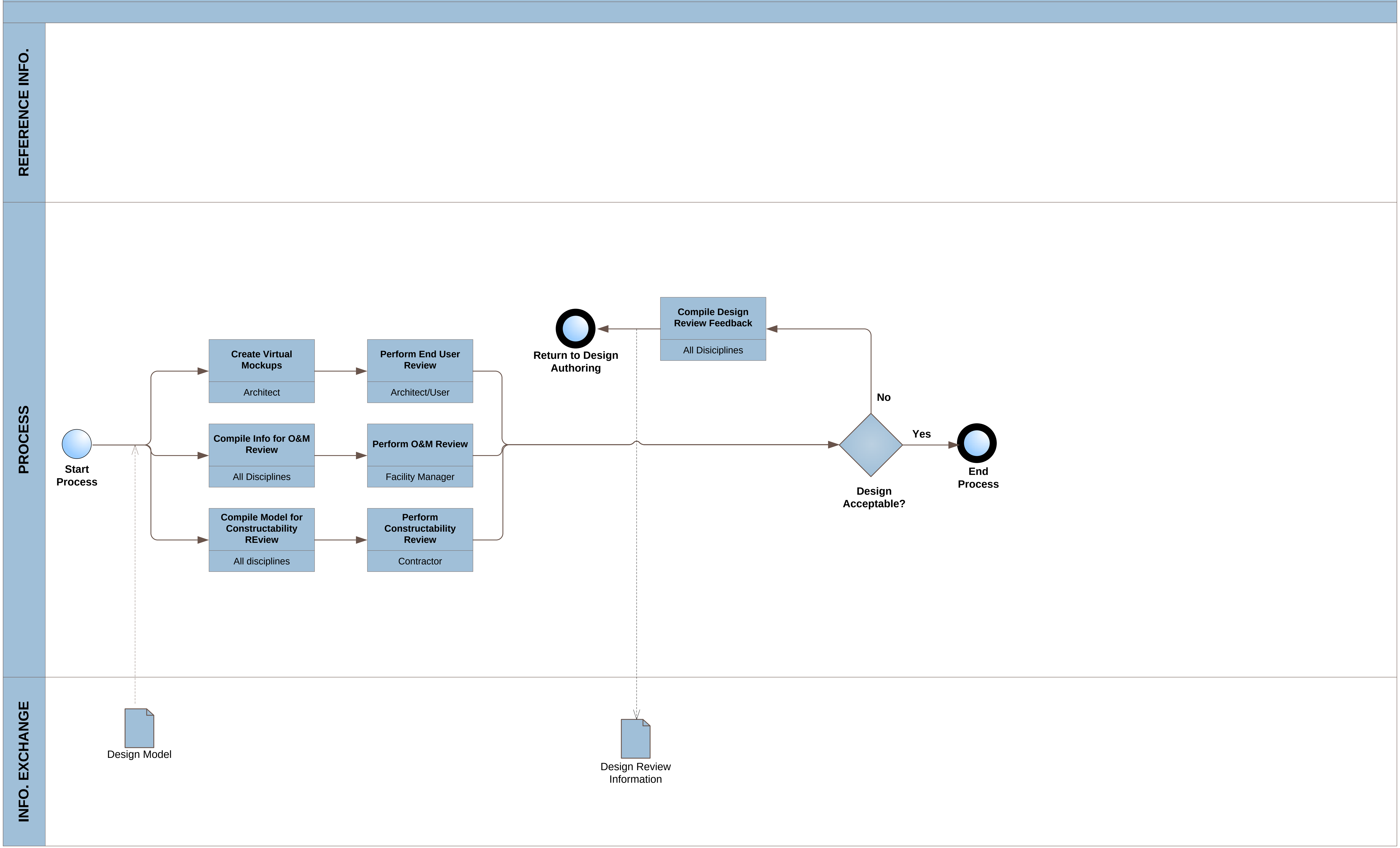
Design Development
Architectural Model
Structural Model
MEP Model
Other

Construction Documentation
Architectural Model
Structural Model
MEP Model
Other

Level 2: Design Review

Project Title

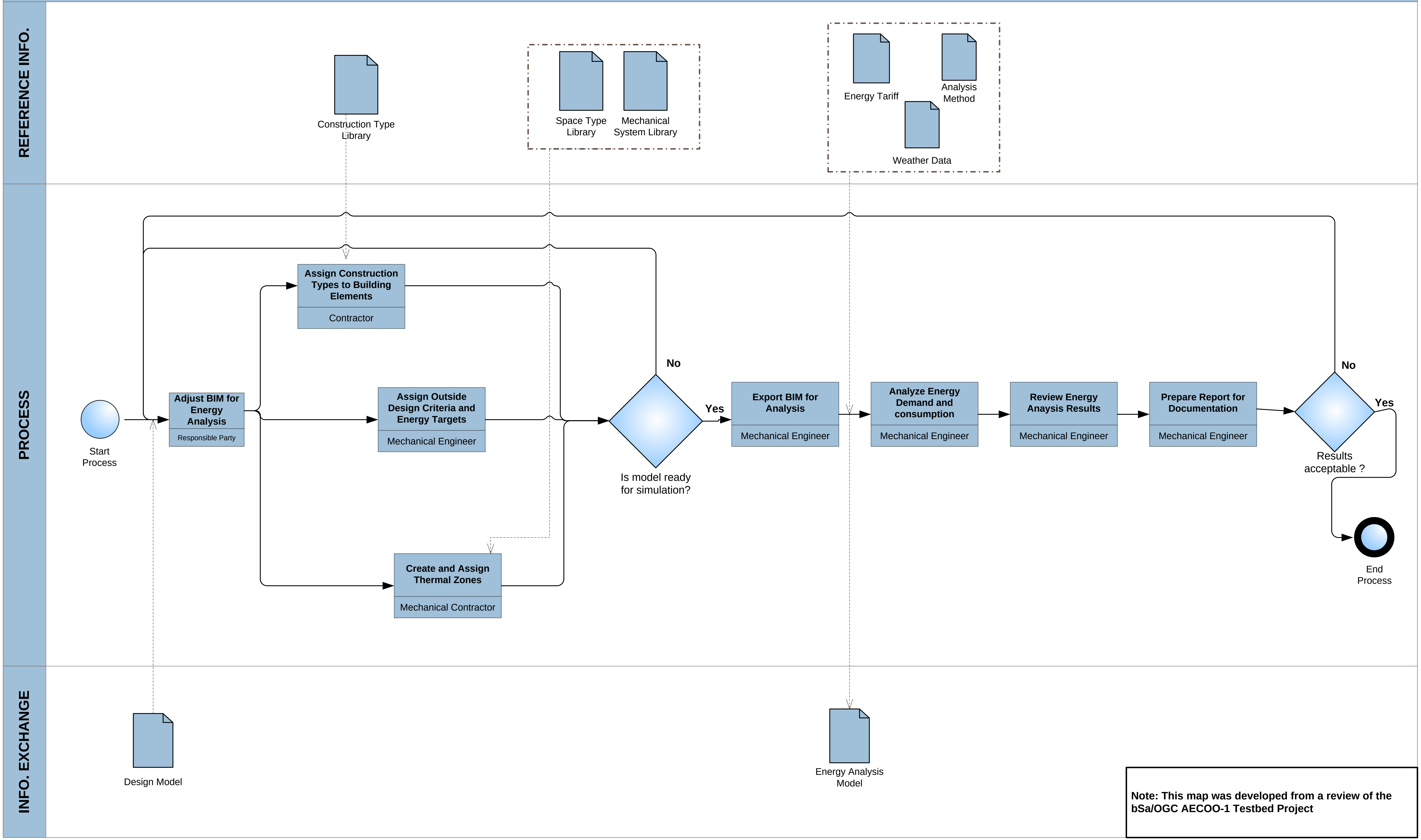
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Energy Analysis

Project Title

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex

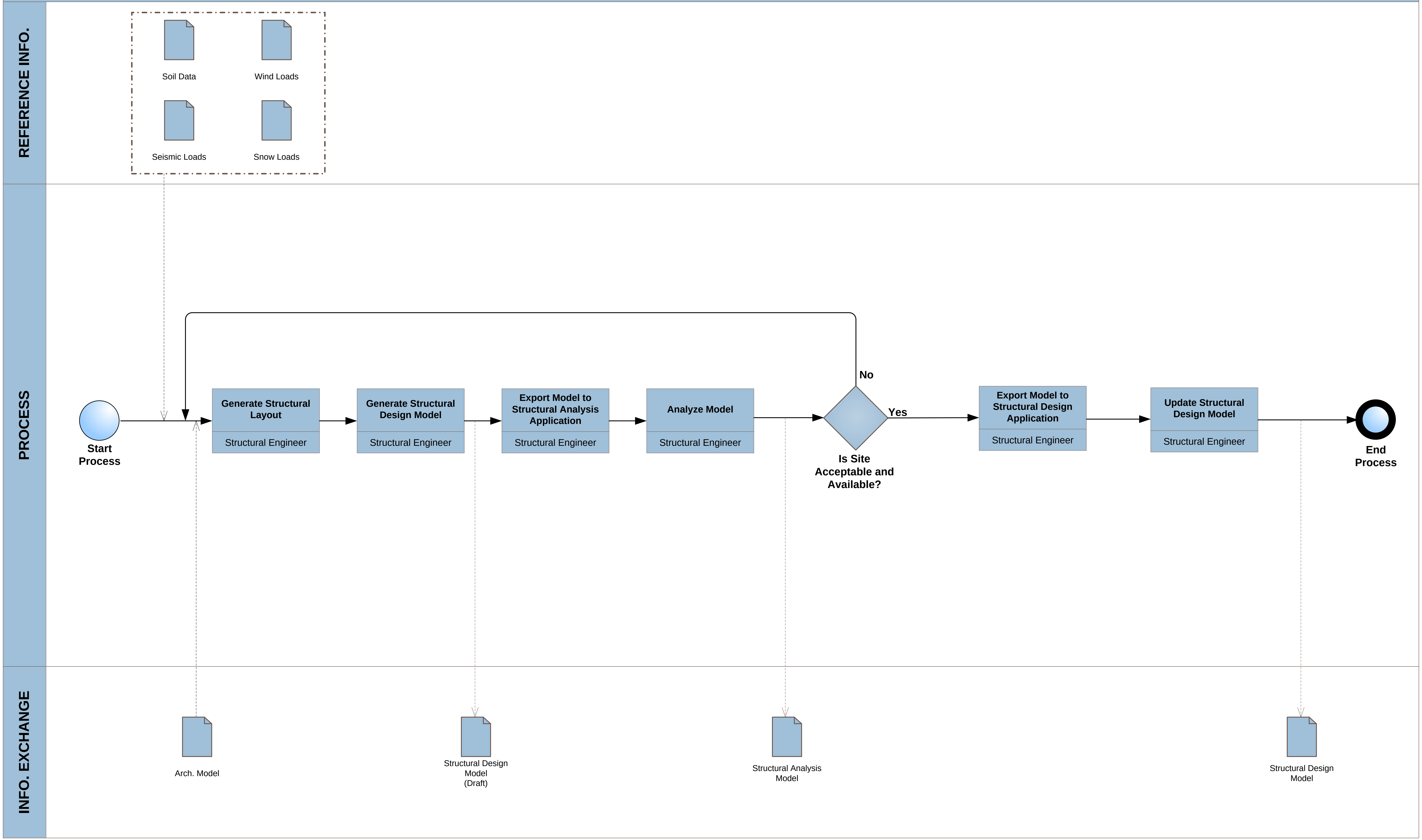


Note: This map was developed from a review of the bSa/OGC AECOO-1 Testbed Project

Level 2: Structural Analysis

Project Title

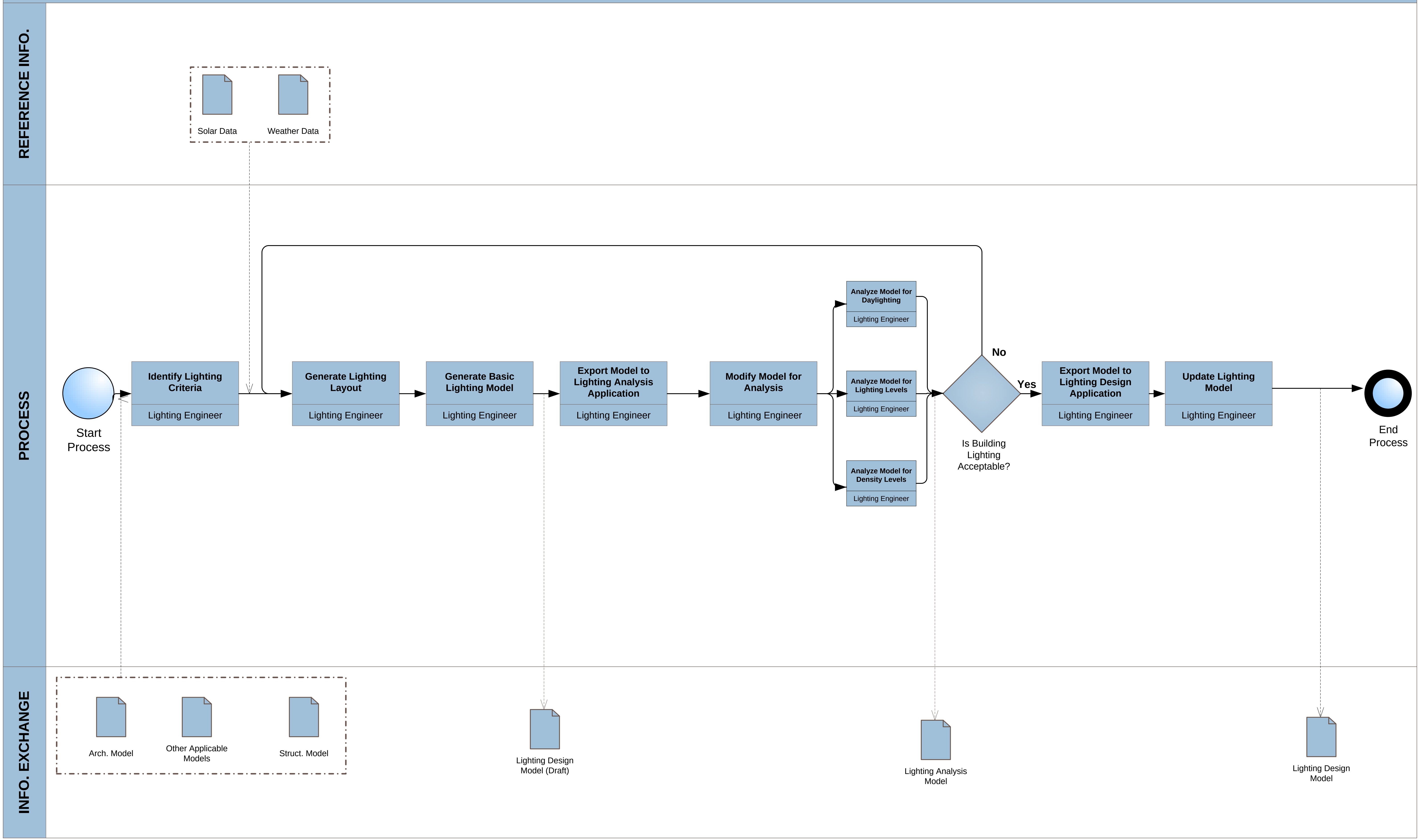
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Lighting Analysis

Project Title

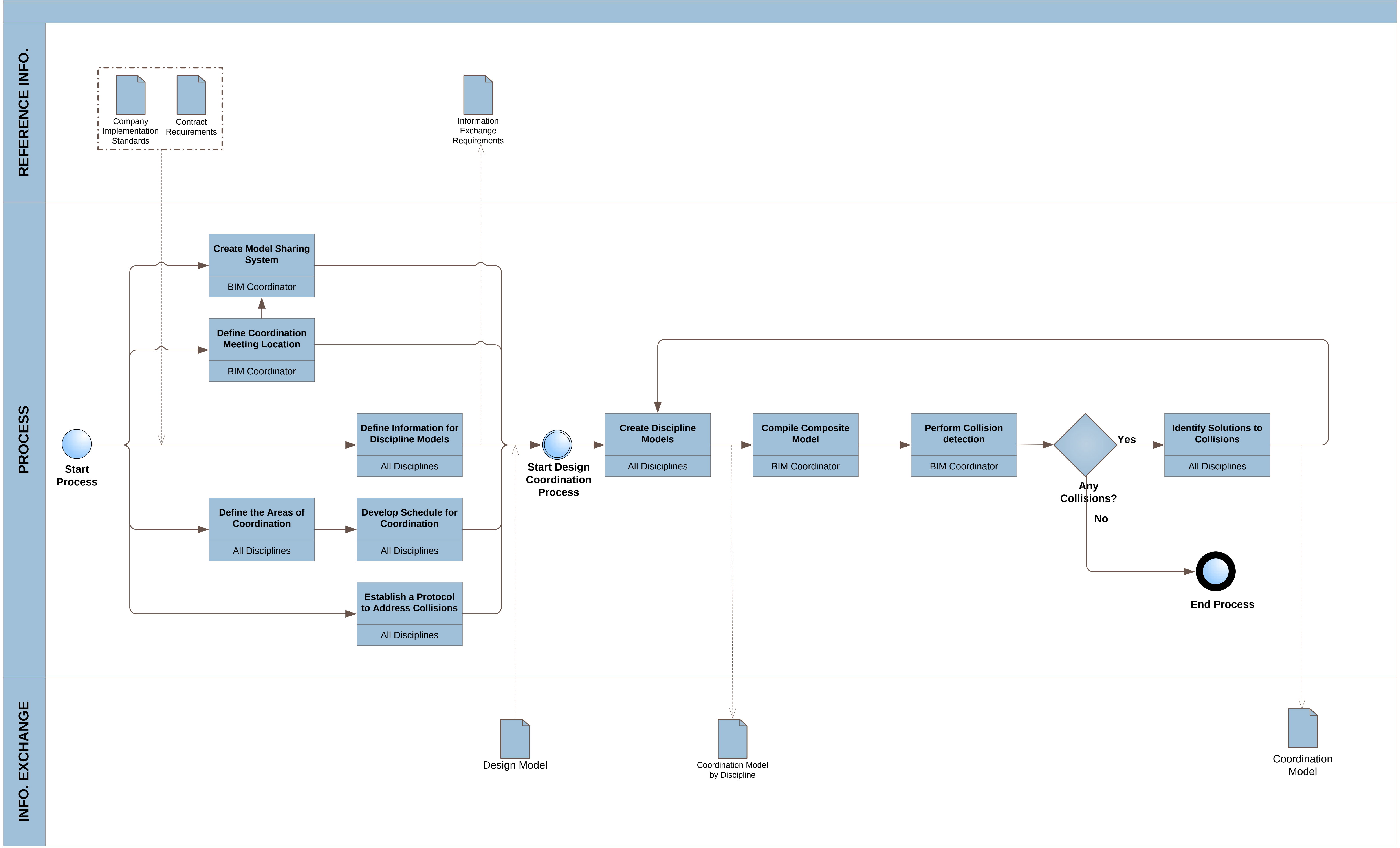
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Design Coordination

Project Title

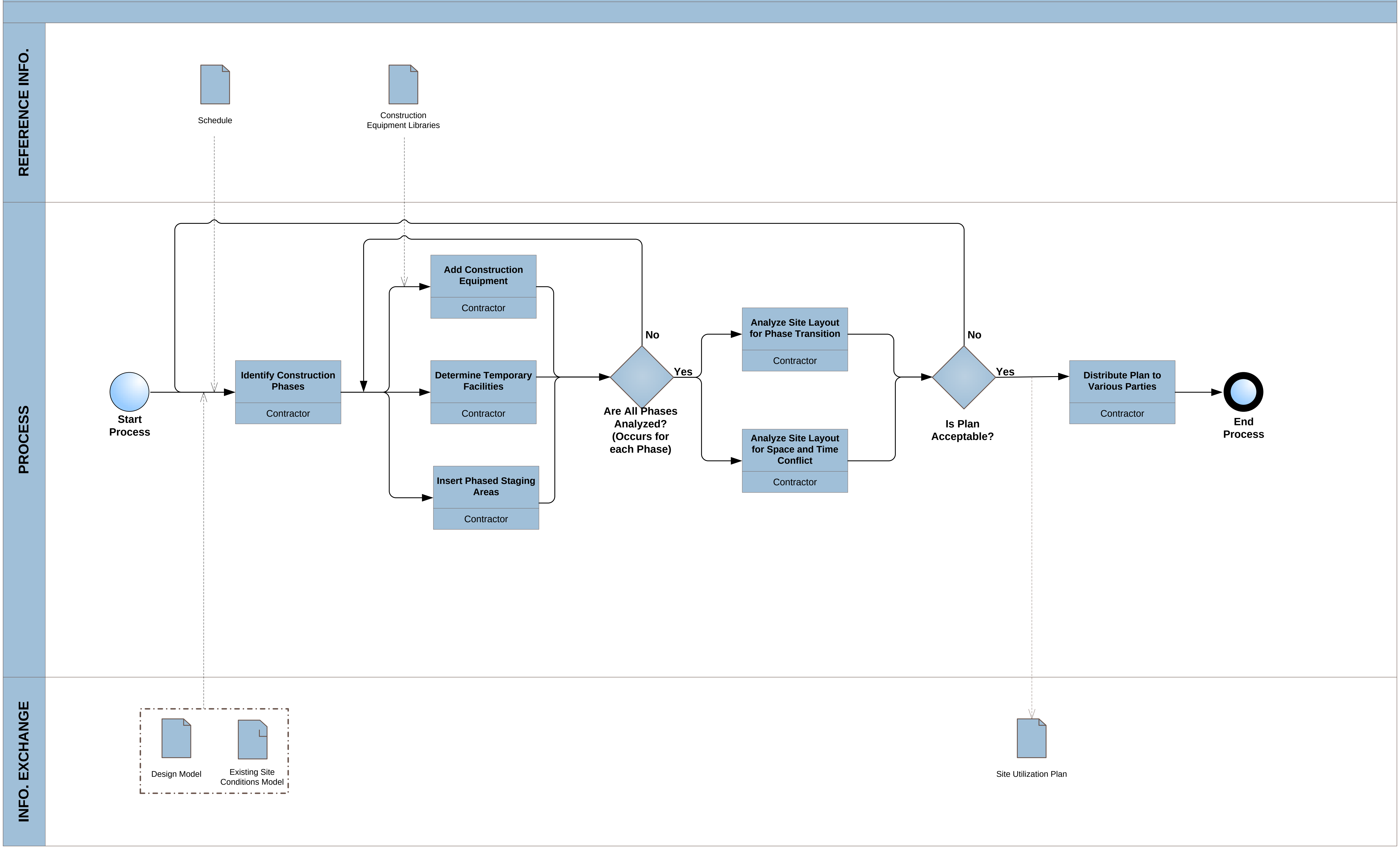
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Site Utilization Planning

Project Title

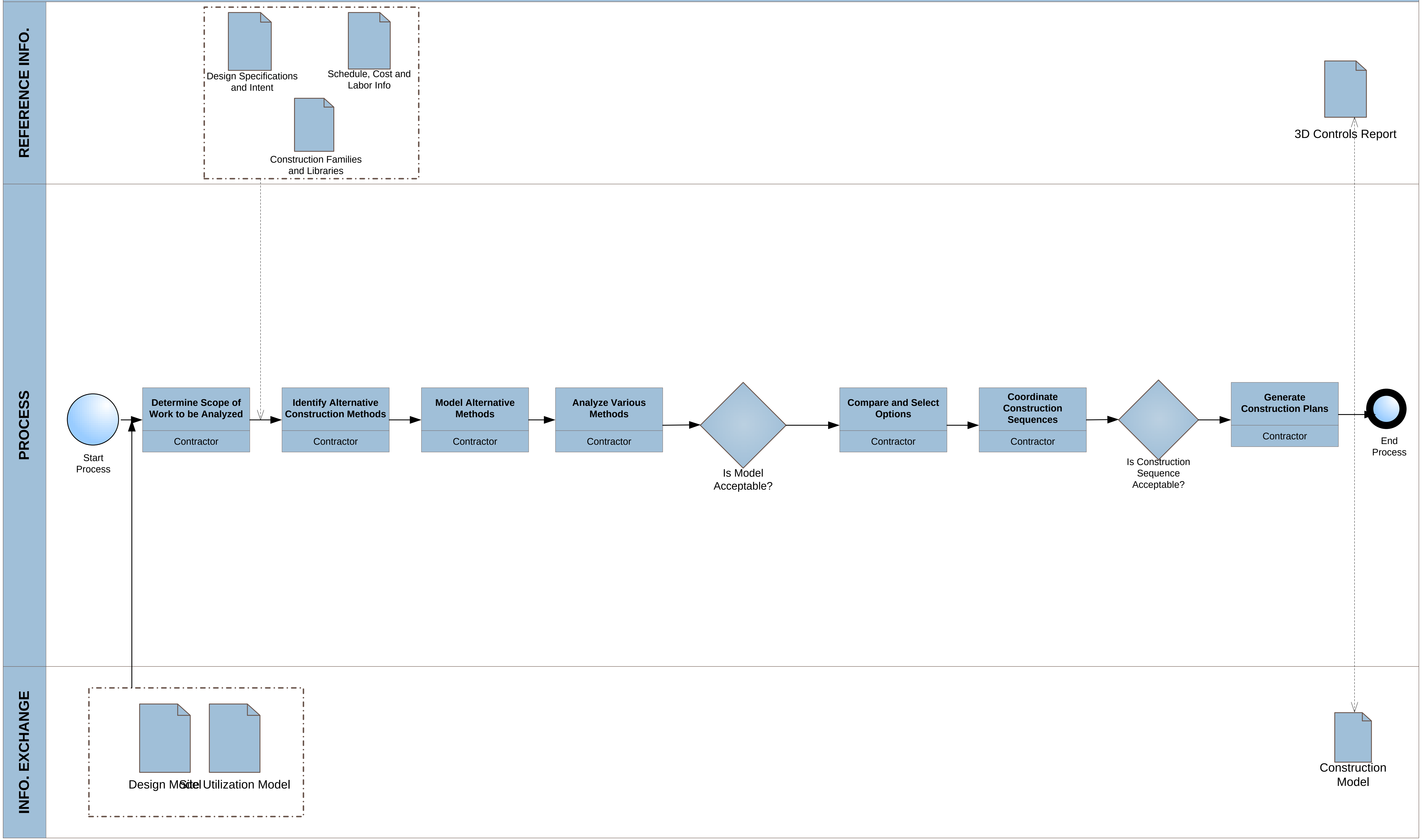
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2:3D Control and Planning

Project Title

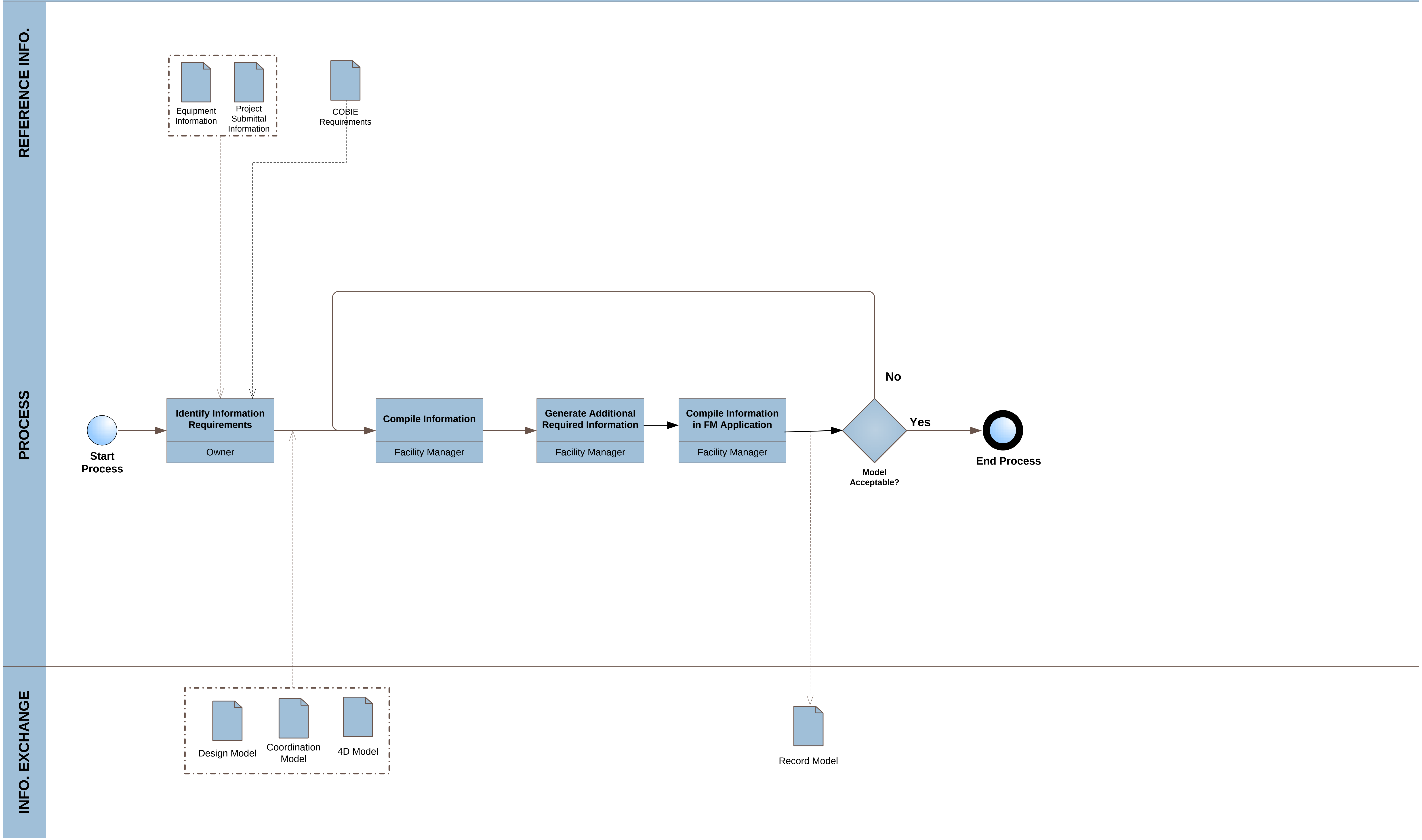
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Record Modeling

Project Title

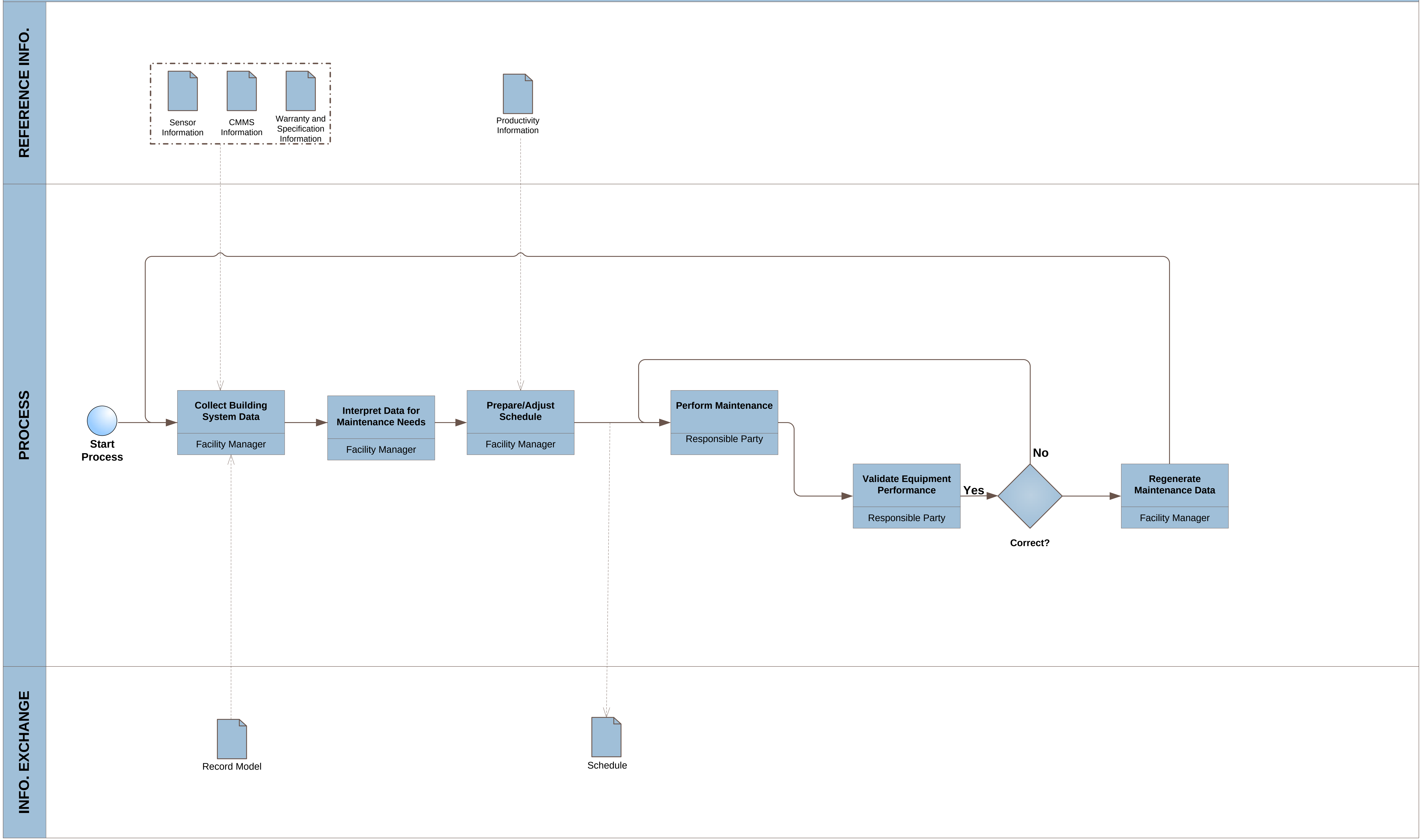
Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Maintenance Scheduling

Project Title

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex



Level 2: Building System Analysis

Project Title

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team.
http://www.engr/psu.edu/ae/cic/bimex